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FAO — The Food and Agriculture Organization of the United Nations — grew out of a United Nations Conference held at Hot Springs, Virginia, U.S.A., in May 1943. The nations agreed to work together to secure a lasting peace through freedom from want. The Organization was formally founded at Quebec, Canada, in October 1945. It was located at Washington D.C. until 1951 when the Headquarters office was moved to Rome.

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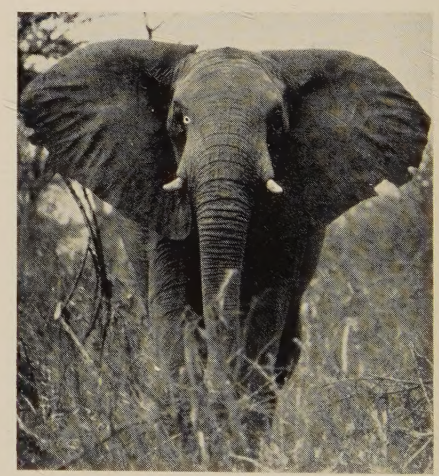

Cover Photograph. *These largest of land mammals, the elephants, are increasing in many parts of southern Africa and some systematic program of cropping is greatly to be encouraged, particularly in suitable areas adjacent to large national parks.*

Courtesy: Thane Riney

Editorial Photograph. *A fine male cheetah near the Mara river.*

Courtesy: Kenya Wild Life Society

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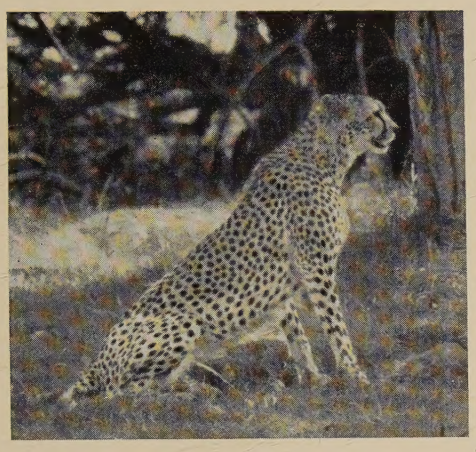


WILDLIFE CONSERVATION AND MANAGEMENT

At its last session in 1959 the Conference of FAO, the governing body of the agency, decided to include wildlife management among the regular activities of the Organization. More recently, FAO's newest Regional Forestry Commission, the African Forestry Commission, meeting in Nigeria in November 1960, decided to set up a special working party charged with developing an action program relating to a specific number of aspects of wildlife conservation and management in the region. In the meantime, FAO will be collaborating in the special Africa project on wildlife of the International Union for the Conservation of Nature and Natural Resources (IUCN), in providing a wildlife specialist for the Congo, and also seconding a member of its staff to serve as Secretary-General of IUCN.

Few would disagree that there is a duty to preserve certain portions of Africa, first, to save some of its wealth of wild animal life, secondly, to protect wild vegetation and places of beauty and interest and, thirdly, to maintain an attraction for tourists.

There is a general acceptance of the alarming conclusion that wild animals are disappearing from the face of Africa at such a rate that within a short span of years they will be beyond the point of no return.

There is no doubt whatever that many parts of Africa have already been denuded of their wild animal populations. Even in living memory, wild animals have gone from South Africa and can now survive only in the few remaining sanctuaries. This is true also of many parts of Central and East Africa.

Explorers and hunters traveling through Equatorial Africa during the last century described the teeming herds of animals which were seen, and yet today many parts of those same countries have no wild animal life whatever. Kenya, which was always regarded as the paradise of big game, has also suffered from this general decline in numbers. This tragic story can be repeated throughout the length and breadth of Africa.

The sanctuaries included in the system of national parks and reserves throughout Africa are hopelessly inadequate to preserve all the species which used to roam the face of this great continent. Africa is a harsh master and its animals are subjected to all kinds of calamities, including epizootic diseases, floods, plagues and droughts. Should a species in one area be destroyed by one of these misfortunes then there is no reservoir from which to draw replenishment. In the old days when animals were exterminated in a particular zone by some calamity, they were not similarly affected in other areas, and they could soon replace their breeding stocks. This substantiates the argument for having as many and as large national parks as possible.

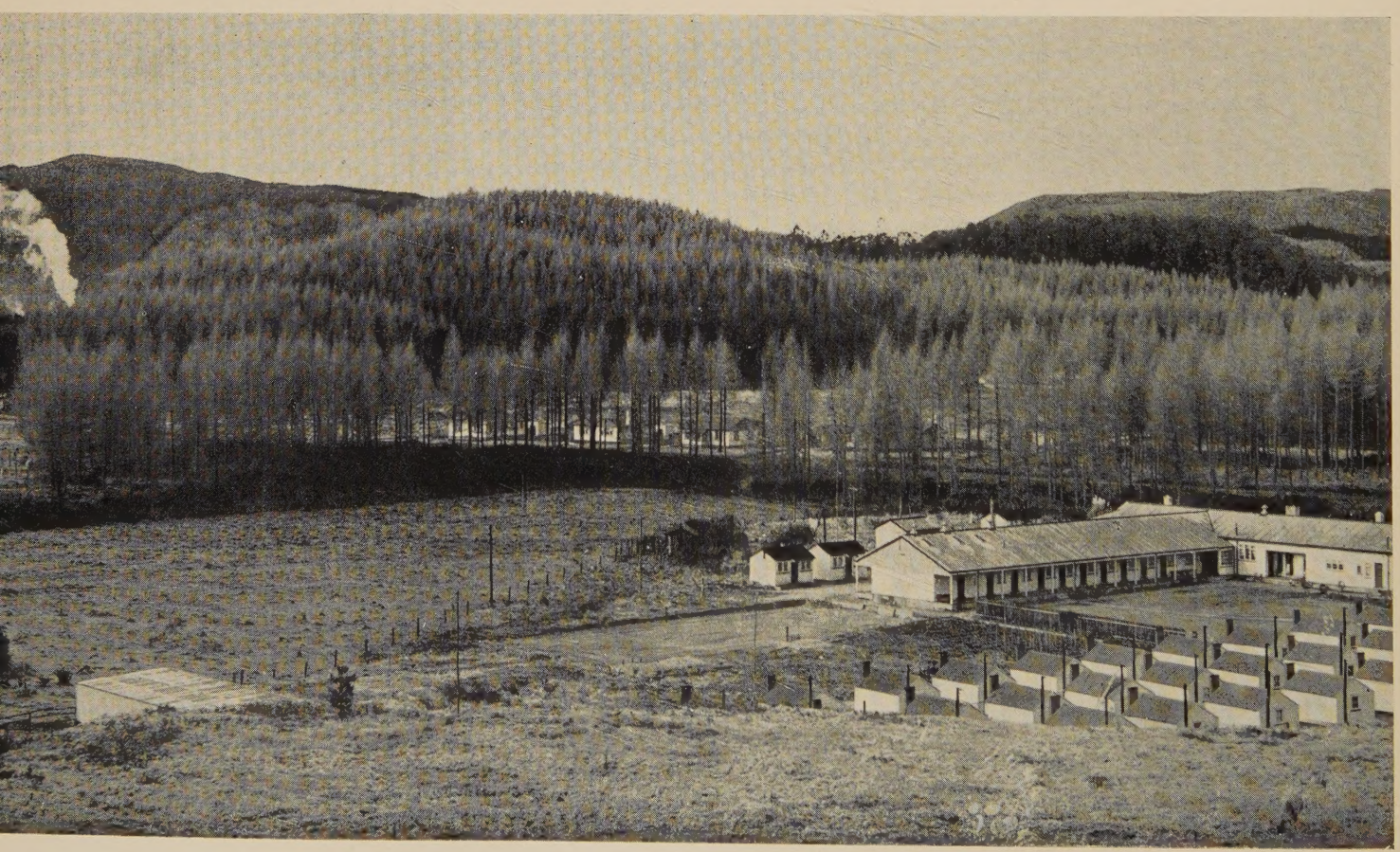
Admittedly, every Government in Africa has the difficult task of zoning its land. Some of it must be used for agriculture, some for livestock, some for settlements, some for towns, and some for other forms of development, but in this scheme of things there must be a place for the wild animal and for wild vegetation. Wild animal habitats, catchment areas and forested mountains must be recognized as a form of land use, and a most important feature of a wise land-use policy.

FIGURE 1. – *At an Indian training center in the Himalayas a forest worker is being trained to fell an awkwardly leaning tree so as to cause the minimum damage.*

Courtesy: H. G. Winkelmann

FIGURE 2. – *A hostel for single men working at a state sawmill in New Zealand.*

Courtesy: New Zealand Forest Service



Social Progress for Forest Workers

Eino Saari
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In recent years there has been growing interest in forest labor questions and the human aspects of forestry.[1] This is partly because one of the youngest branches of forest science, work studies, has initiated research into the techniques of forest work.

Competition with other industries for the acquisition of labor, the scarcity of forest workers at certain times and in some countries, and general problems connected with employment and unemployment have compelled foresters to give more attention to the forest worker, not only as a production factor but also as a human factor in forestry. The literature on the subject is already quite extensive.

Although the International Labour Organisation (ILO) was established as early as 1919, it was rather late in beginning its first special study of forest labor. During the 1930's it collected data on occupational safety and health conditions in forestry. It was not until 1938, however, that more positive action was contemplated. In that year the International Labour Conference passed certain resolutions regarding a world-wide inquiry into the living conditions of forest workers, and the setting up of a joint committee on questions concerning forest labor. The Committee was to have consisted of representatives of the three main groups in ILO and of other international bodies concerned. Preparations for this inquiry were interrupted by the second world war.

Since the war the most important international meeting so far held to discuss these problems has been the Tripartite Technical Meeting on the Timber Industry, convened by ILO in Geneva in 1958. It was attended by a total of 152 people representing governments, employers' organizations and workers' organiations of the 22 countries invited. Thorough preparations had been made by ILO, and a series of resolutions and memoranda concerning accident prevention, working conditions and workers' welfare in logging camps, and labor/management relations were adopted.

The International Federation of Building and Wood Workers which includes forest workers has, during its conferences since 1937, shown keen interest in forest labor questions and has made several proposals.

FAO and the UN Economic Commission for Europe have established a Joint Committee on Forest Working Techniques and Training of Forest Workers. A similar committee is being started by FAO's Asia-Pacific Forestry Commission. The FAO Conference in November 1959 singled out for special mention the co-operation of ILO in this work.

If the social problems of forest workers were similar to those of the manufacturing industries, this topic would need no special discussion or study. But forest work is in several respects very different from work in factories. Some of its peculiarities, particularly instability as regards place and time, dependence on weather and climate, remoteness of places of work from centers of population, the strenuous nature of the work, and great variations in conditions affecting output per day or hour which make it so difficult to calculate wage rates for piece work, etc., impede the solution of the social problems of forest workers.

For the sake of brevity, only some of the worst obstacles — and their impact on social progress for forest workers — are dealt with here. Long-distance timber transport, and work in sawmills, pulp and paper mills and other manufacturing industries are excluded.

Among forest workers, forest owners working in their own forests, cutting and hauling timber either for sale or intended for their own use, carrying out forest improvements, etc., form a special group of their own. In this case there is no labor/management relation as employer and employee are the same person. Working conditions depend on the worker himself, and his social position is the same as it is in his other work. Wages are only an item for the books – i.e., the total price of timber can be divided between stumpage and wages in whichever way he wants to note them in his accounts.

This kind of work carried out by the farmer himself or members of his family is common in farm forests. In countries with a high percentage of such forests where it is the custom to sell timber ready cut at the roadside, the labor input of these self-employed farmers is considerable. According to Heikinheimo, work done by farmers in their own forests in Finland during 1950 accounted for as much as 45 percent of the total labor input in forestry calculated in man-days. This percentage may be higher than in any other country.

But in dealing with the social problems of forest workers, the group mentioned above is generally excluded and only hired labor is referred to. What follows should be taken in this restricted meaning.

[1] Adapted from a paper presented at the Fifth World Forestry Congress.

Instability of forest work

Probably the most difficult problem and the most peculiar feature of forest work is the high degree of instability in many countries.

First, there is local instability caused by shifting of the places of work. In the early stages in some countries logging operations were almost nomadic — as indicated by the old saying " cut out and get out. " This was particularly prevalent in North America where virgin timber resources used to be managed like mines. But even in developed forestry, where sustained yield is considered, as a rule the work moves on from place to place. In small wood lots the annual movements are so small that they have no effect on labor conditions. On the other hand, in large public or private forests, logging areas and silvicultural operations may move such distances — if not every year at least every few years — that housing has to be completely reorganized.

The more the sustained or progressive yield principle is respected and applied to smaller areas and the more intensive forestry becomes, the less it is necessary to move logging camps. Thus local instability can be considered a surmountable obstacle.

Much worse are the seasonal fluctuations, mostly caused by the climate. They form an important factor in countries with great differences between summer and winter, particularly northern Europe, Canada, the northern parts of the U.S.S.R. and some parts of the U.S.A., where the land is snowbound in winter during a long period. In these conditions logging is to a large extent carried out in winter. As logging requires more labor input than all other forms of forest work together, there is a distinct cyclical movement in forest work with the peak in winter. In some parts of the world an excess of snow, rainy periods, fire hazard periods, etc., cause interruptions in the operations, and more or less cyclical fluctuations.

These cycles are the principal reason for the peculiar structure of the forest labor force in many countries, where labor can be divided into professional, regular seasonal, and occasional workers. The term " professional " in this context applies to those who are mainly occupied in forestry. Their number cannot be higher than the number of workers required during the slackest season of the year. Regular seasonal and occasional workers must be employed by other industries for a longer or shorter part of the year. A large number of them are farmers or farm hands who cannot find sufficient employment in agriculture during winter.

If the seasonal cycles are violent, the ratio of permanent workers is small. The term " permanent " in this context indicates that the same worker/employer relationship lasts a long time.

Where the proportion of seasonal and occasional workers is high, as in Scandinavia and eastern Canada, many social problems facing forest workers — housing, the establishment of organized labor/management relations, training, social insurance — are a source of great difficulty. It is no wonder that so much research work and experimentation has been done to find ways of " deseasonalizing " forest work. The problem has received particular attention in Canada, Scandinavia, and the U.S.S.R.

The mechanization of forest work, the improvement of roads and transportation, better labor planning, new forms of housing etc., seem to offer possibilities of stabilizing forest employment — if not yet completely, at least to some extent. This trend has also been necessary in regions where there are no farmers ready to go to the forests in wintertime or where the number of such people is not sufficient for large-scale logging operations. This is particularly true in certain parts of Canada and the U.S.S.R. In Sweden it has been noted that, although forest work and agricultural work have traditionally been alternative occupations for farmers, there is now a trend in some areas for the two occupations to be practiced separately by different groups of people. For example, in February 1954 as much as 38 percent of the workers in the state forests and those owned by the forest industries companies were permanent. The decreasing number of the agricultural population and the advantages of a permanent labor force explain this trend.

My own country, Finland, is in a special position as regards this problem. Our foresters are convinced that a larger proportion of permanent professional forest workers is beneficial both for forestry and for the workers. A lot of work has been done and is being done to push development ahead in this direction. The seasonal fluctuations have been decreasing. But we cannot take advantage of all the possibilities that modern techniques and organization open up because we have a large number of small farmers for whom forest work is absolutely essential in winter. This national employment problem is an obstacle to the progress of " de-seasonalization " in forest work.

Security of employment

In many countries forestry is very sensitive to business cycles. This results to a large extent from the rather heavy fluctuations in the building industry, which is the most important customer of the sawmills. As logging is the biggest item in forest work, the fluctuations in annual quantities cut can be very large. Where such fluctuations prevail they pose a difficult problem for the maintenance of security of employment.

The annual fluctuations and the seasonal character of forest work make many social security measures much more difficult than in manufacturing industries. This is the case in regard to unemployment insurance or other forms of unemployment compensation and old age pension schemes payable by the employer. Accident insurance is no longer a problem, though there are some minor difficulties peculiar to forestry.

It is difficult to establish and maintain labor unions among seasonal and occasional workers. This is true particularly in countries where forest labor includes a

large number of farmers. They often consider themselves as belonging to a different social group from professional forest workers and perhaps they already belong to farmers' organizations with different interests. The short working periods, the shifting and changing nature of forest work, the high turnover of workers, and, in many cases, the difficulty of finding meeting-rooms, etc., are also reasons why forest workers in some countries are organized into unions to a very small extent. The more stable logging is, the stronger is the forest labor organization. The West Coast in America may be mentioned as an example. In such cases it is easier to establish regular and effective labor/management relations. This was widely discussed at the tripartite technical meeting arranged by ILO referred to earlier, and a long memorandum was adopted, including ideas for collective bargaining, consultation and co-operation, the settlement of disputes, and training.

Housing

One of the major forest labor problems is housing. In countries or regions with a dense population, and good roads and transport, the forest workers can live at home. From a social point of view this is a good solution and is the case, for instance, over large parts of central Europe. If the workers' houses under such conditions are poor and call for improvement, that is not a special problem of forestry.

In large remote forests, accommodation must be organized differently. So far, logging camps have been the most common solution in many countries, but such camps are generally built only for the workers, not for their families. This system is known in all regions with a sparse population and long distances to population centers. Many countries have laws or by-laws as to minimum requirements. Generally, too, some system of inspection has been established.

At the tripartite technical meeting a special memorandum was adopted covering proposals on the location of camps, heating, lighting and ventilation, furniture and beds, protection from insects, sanitary and bathing installations, places for drying clothes, feeding arrangements, health and hygiene, recreation and administration.

A weak point in this housing system is that men are generally compelled to live away from their families for a long time. In other respects, too, long periods in a small camp always with the same people may lead to dissatisfaction.

As the road system and transport improve, more and more of the workers can live at home or at least return there for the weekend. But where this is not possible, camps are so far the only solution for seasonal and occasional workers.

As mentioned before, great interest is now being shown in increasing the proportion of permanent professional workers. This trend offers opportunities for improving housing, and two different systems have been adopted. "Forest villages" are being built at reasonable distances from places of work. The villages are built for families and therefore provided as far as possible with schools, shops, facilities for recreation, etc. This system is to a large extent in use in the U.S.S.R.

Another way is to build solitary houses or small groups of houses for forest workers, so located that a sufficient amount of work can be ensured for the whole year. Life is easier for the family if the houses can be built in or near a village. This system is much in favor in Scandinavia.

The houses can be owned either by the employer or by the worker.

In several countries the trend seems to be toward permanent housing of the worker with his family. Sweden, for instance, has made such progress in this direction since the second world war that logging camps are slowly becoming less necessary. The improvement of transport also contributes to the trend.

Wages and training

Wages in forestry involve some peculiarities. To a very large extent work is paid at piece rates. But these rates are often difficult to calculate fairly for the worker. Trees and tree species differ in size and shape, the terrain, the weather and the number of trees to be cut per acre vary, as, too, do marketing requirements, etc. Nowadays, the wage rates are more often based on objective time and motion studies, but even so the systems are frequently complicated. Disputes may also occur between the worker and the employer's representative as to the measure and quality of timber cut. In some countries, official systems are arranged with legal measures in the event of dispute. Such difficulties can be overcome with the aid of work science.

The training of forest workers is also an important contribution to the social progress of forest workers, and this importance is highlighted by the mechanization of logging and other forest work, and the increasing number of permanent forest workers. Many countries have already organized training satisfactorily but in others it is still only in the planning stage.

As was said at the beginning of this paper, social progress in forestry is faced with more and greater obstacles than in most other industries. But this is no excuse for foresters or forestry employers to let forestry remain underdeveloped in this respect. Foresters are responsible for the social progress of forest workers. If they are unable to cope with this, they are not fully competent foresters.

Obstacles to Tropical Forestry - Land Tenure

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Some of the current problems of tropical land tenure are more obviously the concern of agriculturists than of foresters, because a great deal of the land that is used for forestry is kept out of ordinary circulation by government ownership, with the result that it is insulated to some extent against developments that take place on agricultural land. Foresters, however, may find that they are mistaken if they think they can disregard these developments. Even where government ownership of forest remains the fashion, changing conceptions of land are likely to affect the terms of government tenure and its security.

It is the writer's belief [1] that most countries are moving toward land tenure systems based on individual freehold ownership and that, although government intervention may in some cases delay the evolution, it is doubtful if it can continue to do it indefinitely because the idea of individual ownership seems to be universally attractive to the people who use the land, once they have grasped the idea of it. It is suggested that we may soon see the same kind of changes in tropical landscapes as took place during the enclosure movements of European countries, leading for instance to Africa within the next 100 years being divided up into freehold properties by fences and boundary marks and other visible evidence of ownership.

Freehold ownership in temperate climates

In northwest Europe freehold ownership of land is a recent institution. Within times covered by historical records, land was a free natural resource and the only limitation on its free use was the necessity for people to live together in communities, so that cultivable land near a settlement could be in greater demand than better land further away. That limitation demanded some form of land administration, comparable to some of the unwritten codes found in tropical countries today, to give everybody a fair share of the best and worst land and of the least and most accessible, and to prevent overuse of the more accessible.

The conception of freehold titles in the hands of the actual users of the land developed from communal and feudal tenure under the influence of a variety of causes, but a very important influence which led to the sudden enclosure movements of the countries of northern Europe was the discovery that land could be farmed continuously without the need for the customary biennial or triennial fallow.

During these developments the fate of forest land was decided largely by historical accidents. In some European countries the State succeeded, at one stage or another, in pulling land out of general circulation, so that it escaped the legal evolution that affected the rest of the land, and a few governments managed by accident or design to establish full titles to considerable areas of land that now go to make up the national forest estates.

In the United Kingdom, government-controlled land only occurred on a very small scale, because of forest reservations made in Norman times, but over a part of these early reserves the Crown did continue to assert its rights with sufficient regularity to preserve them against freehold encroachment, so that the Forestry Commission in 1923 was able to take over about 100,000 acres (40,500 hectares) of Crown land, heavily burdened in many cases with rights of common, but nevertheless with an indisputable title of ownership.

There were probably opportunities during the early history of England when the Crown might have built this area up to the present state target of three million acres (1.2 million hectares), but from 1750 onward that possibility disappeared very rapidly, as most of the land that ought to have been earmarked for state forestry began to slip into individual ownership. The period of the enclosure movement was the last chance that the Government had of building up its national forests cheaply.

Dangers of freehold ownership

Individualization in land tenure, provided that it is foreseen and is preceded by intelligent land-use planning, can usually be accepted as logical evolution. The danger to be feared is an evolution that takes a country by surprise.

Land that is unsuitable for development under individual ownership should not be allowed to become involved and steps should be taken at an early stage to withdraw it from circulation. That is more or less what has been done, for instance, in Canada, where conditions for doing so were relatively easy because most of the land north of a certain latitude could be identified as unsuitable at present for private ownership.

[1] Adapted from a paper submitted to the Fifth World Forestry Congress. W. A. Gordon is the author of *The law of forestry* (H.M.S.O., London, 1955).

Where this sort of land can be identified, it should be removed from circulation as soon as possible, and it so happens that in most of the tropical territories of the British Commonwealth, forest ordinances provide the only machinery for doing this.

Fragmentation and subdivision of land in shares are among the more dangerous developments that follow unplanned extension of freehold titles. In the early days, before this was understood, the United Kingdom was fortunate in having the protection of the rule of primogeniture, which helped to prevent fragmentation on inheritance. By abolishing primogeniture about a century too early, Napoleon initiated the process of fragmentation which has become a major problem of land use in most of the European countries that formed the Napoleonic Empire, while under other systems of law, notably the Ottoman Code, which contains no safeguard, land sometimes became so fragmented that it ceased to be possible to use it economically. In the newer countries of the tropics, unless land tenure law receives skilful guidance in its development, fragmentation will inevitably occur, as customary tenure that has grown up with tribal ownership is replaced by individual freehold. This might eventually be expected to have its impact on forestry, because the only land that would escape fragmentation and remain available in unfragmented blocks would be areas such as forest reserves which had been withdrawn earlier from circulation.

Freehold tenure in the tropics

It might be argued that the enclosure movement would not have occurred so soon in Europe or on such a large scale, if the means had not been found of farming land without periods of unproductive fallow, either through dispensing with fallow altogether or using the fallow period to produce something useful. When land is not cultivated continuously and has to be left at intervals to natural fallow, other people may use it for purposes such as grazing, and that by itself can be enough to obscure the conception of ownership by individuals.

In the tropics this consideration is likely to have an even greater influence, because fallow plays a bigger part in tropical farming than it ever did in Europe. In the wet tropics most land still has to spend more time under fallow than under the plow, and this necessity provides an ecological barrier against the rapid individualization of tenure on land used for annual crop cultivation. On land that is used for subsistence farming of annual crops under a natural fallow rotation, individualization may be a slow process depending on the discovery of means of dispensing with fallow, on the development of techniques which involve treatment and management of fallow and on the prospects of using fallow periods to produce a useful crop. The acceptance of a tended forest crop as a stage in tropical crop rotations is a possibility that should not be neglected.

Where perennial crops are grown, individualization of tenures might be relatively rapid. Perennial crops need security of tenure and their mere presence on the ground provides visible and continuous evidence of title. Although perennial crop cultivation may prove to be a serious rival to forestry on certain kinds of land, it should not be forgotten that a forest plantation is itself a perennial crop and a particularly suitable one for extensive staking of land ownership claims.

The impact of state forestry

State forestry in some parts of the tropics is having its impact on land tenure development in ways that have not helped to make forestry popular with the administration. By staking their claim to 10 or 20 percent of the land of a country, foresters bring forward problems that might not otherwise have arisen in this generation. By bringing shifting cultivation to a halt and enforcing more intensive methods of agriculture, forest reservation is helping in its own way to hasten the trend toward freehold ownership.

The withdrawal from circulation and protection against haphazard occupation of large intact blocks of land is probably a sensible procedure to follow in tropical countries. So long as there is uncertainty about the correct use of tropical land, it is as well to localize mistakes, and, until it is known whether land tenure law will develop on satisfactory lines, it is desirable that a proportion of the available land should be held back in reserve. If, for instance, inheritance rules are obviously going to lead to fragmentation, it will be useful to have some land in reserve that will be protected against the process.

Responsibility for the reservation of land has been left almost everywhere in the hands of forest services and, although it might be argued that a forest service is the wrong authority to be left with such a task in the early stages before the ecology and economics of tropical land use are properly understood, it does so happen that forest ordinances usually provide the only legal machinery through which such a thing can be done at all. At the same time, it is suggested that foresters are deluding themselves if they imagine that a high proportion of the land that they are reserving for forestry is going to remain dedicated to forestry for very long.

It is suggested that perennial crops are likely to prove a far more serious danger to the security of the forest estates of tropical countries than subsistence farming of annual crops. In spite of all the lessons of the past, it seems likely that there will be an undesirable amount of land fragmentation in the tropics when freehold ownership starts to develop, and that unplanned development of individual ownership will result everywhere in situations where large intact blocks of land cannot be found anywhere except in forest reserves. When capital becomes available for large plantation projects of perennial cash crops and when large blocks of land are required for the purpose in a hurry, the

status of some forest reserves is likely to become precarious.

In some tropical countries, such as Ghana and Western Nigeria, where most of the forest reserves consist of potential agricultural land, it is suggested that the only hope for their survival lies in the early establishment of highly capitalized wood products industries which require large and sustained yields of forest produce. This type of industry has been unaccountably slow in establishing itself in the tropics and it is suggested that in some cases governments themselves are to blame for failure to devise tenures likely to attract commercial investment.

Tenures of state forest land

Forestry is an industry which can become highly nationalized almost without its being noticed. Ownership of forest land is apt to fall automatically into government hands. A Government, as owner of a national forest estate, has several alternatives open to it:

(*a*) government investment, sometimes leading to overnationalization;

(*b*) " dog in the manger " approach, commonly expressed in a policy of annual forest leases;

(*c*) delegation to private interests of some or all of the responsibilities of ownership;

(*d*) outright alienation.

If the experiences of Cyprus and Trinidad are any guide, management and development carried out directly by a Government may be the best method of insuring a high standard of silviculture; but it is doubtful if this is always enough to compensate for the disadvantages. Private enterprise is apt to be stifled so that the Government is obliged to intervene more and more in manufacture and even in trading. It would seem that nationalization, once it starts, may have no end to it.

The result of government management in Trinidad has been a patchwork sawmilling industry. In Cyprus it discouraged investment in manufacture to such an extent that, when wage increases began to price handsawn timber out of the market, there was not enough machinery in the country to take over.

The Forestry Commission in the United Kingdom still shows a tendency to follow the same path, although its ill-effects are unlikely to become noticeable while a high proportion of the productive woodland in the country is privately owned. As government holding of productive woodland rises above 50 percent, it is to be hoped that present practices of retailing standing timber on short-term agreements will be replaced by tenure policies more related to the needs of industry.

It is admitted that unimproved tropical forest may be a special case. As a commercial venture, sustained yield management of the ordinary run of unimproved tropical forest is likely to be little better than marginal, so that government management and investment may well be a necessary step in the first rotation. But, after advantage has been taken of the first rotation for improvement and enrichment, the case for denationalization may be strengthened, as it has been for instance in Kenya as a result of the success of the government plantation program.

As a matter of history, the " dog in the manger " approach seems to have been favored for a time in parts of eastern Canada. The term is used here to describe a state of affairs where the Government, while itself evading responsibility for management and investment, at the same time refuses adequate facilities to private enterprise. It is my belief that the annual forest lease was first invented in Ontario during the nineteenth century and was carried from there into the Caribbean by West Indian surveyors who received their technical training at Toronto.

The annually renewable lease seems to have most of the disadvantages of the other alternatives and few of their advantages. It effectively ensures the minimum degree of investment at all stages of logging manufacture and marketing and is an open invitation to the concessionaire to cream his holding of the best timber and then abandon it in favor of another area before his competitors have time to get ahead of him. This criticism is applicable generally to most forms of short forest leases and licenses.

The delegation of the responsibilities of ownership to industries of proved reliability is a course that has much to commend it, but its success depends upon correct timing. Kenya and the Bahama Islands provide useful examples of the relinquishment of too much control at too early a stage. In the first quarter of this century the Kenya Government granted concessions over extensive areas of the natural forests under long-term agreements, some of which have not yet expired. The purpose of the policy was the encouragement of investment in the timber trade, but individuals were given what, in the circumstances of that period, turned out to be far too free a hand and the Government retained too little control. It would be unfortunate, however, if this experience were to frighten the Kenya Government away from further experiments in long-term tenures.

In the Bahama Islands at the beginning of this century, most of the pine forests were leased to a single company on a hundred years' agreement which has left the Government with very little control and has limited the obligation of the lessee for royalty payments to something less than a halfpenny per cubic foot.

It is suggested that, until the time arrives when commerce can be trusted with complete powers of management of a national resource, the following matters should be provided for in a forest concession:

(*a*) Major decisions on yield control should remain the responsibility of the State.

(*b*) Adequate provisions should be made for silviculture and regeneration, although when this responsibility is delegated it can hardly avoid carrying with it a vested interest in the yields of subsequent rotations.

(*c*) Royalties should be revisable in accordance with the changing value of money.

(*d*) Adequate investment should be ensured by the annexation to each concession of a manufacturing plant of appropriate capacity on the terms that the one cannot be disposed of separately from the other.

After many years of experiments, British Columbia has devised a new system of leasehold tenure which embodies all these principles and comes as near as any lease could to complete alienation. In the proceedings of two public enquiries, which took place during the development of this form of tenure, there is material which must be relevant to the tenure problems of many tropical countries.

It is not suggested that long leasehold tenure is the absolute limit to which governments should be prepared to go in divesting themselves of the control of national forest resources, nor is it suggested that the nineteenth century alienation policy of the United States of America was necessarily wrong in principle: the fault of that policy was merely one of timing. The United States alienations were made to individuals and companies that had relatively small investments at stake: many of them regarded their investments as expendable and were prepared to budget on large profits over short periods. In a different category are the huge industries now appearing in some parts of the world with share prices prominently quoted on stock exchanges and held by shareholders in expectation of sustained and growing dividends, and with factories planned for continuous improvement and periodical replacement of obsolete parts. It might be considered that some wood products industries in Europe and North America have now reached a stage where they could be trusted with unconditional control of a national resource.

It might be argued, of course, that there is hardly any industry operating at present in the tropics which has yet reached a stage of maturity to be trusted with tenure of the British Columbian type. On the other hand, the only hope for the survival in some tropical countries of an adequate forest estate against the pressure of individual freehold claims would appear to depend on some sort of alliance between forest services and manufacturers. Security of tenure granted by governments, even to the extent of outright alienation in suitable cases, might be justified wherever it can encourage rapid investment.

Third party rights over forest land

In conclusion, brief consideration should be given to a much narrower subject, the problem of third party rights over land, which forms the borderline between land tenure law and the law of contract. Third party rights, exercised over land by persons not claiming ownership, have been a feature of most land tenure systems, particularly in the extensive phases of land use. In some cases the burden of such rights has grown to such proportions as to prevent economic land use. In this respect forest land has suffered particularly.

If, in the course of the development of land tenure law, provision for the exercise of third party rights cannot be avoided, the English system provides quite a sensible model and does as little damage as anything that has ever been evolved. The law of third party rights grew up along with permanent settled agriculture and, in the course of its development, became subject to rules which are simple as well as sensible. The benefit of a right cannot be owned by individuals; it must be attached to a piece of landed property, the right of using the benefit is limited to the individual who is occupying that property at any time, and the exercise of the right is rationed to the needs of the property to which the benefit is attached.

When an area was declared to be a Crown forest in the early days of English history, rights of grazing became attached to properties at the edge of it that were occupied at the time of the declaration. The occupants were allowed to graze in the forests with such animals as it was necessary for them to have, and the number that each person was allowed to graze was limited to the number that his holding would support in winter when pasture was scarce. Fuel rights arose in the same way and were limited to the domestic needs of the houses to which they became attached. Fuel cannot be sold and it cannot be used for non-domestic purposes and it cannot be claimed by the owner of a new house. The effect of all this is that the burden falling on land as a result of third party rights can never be substantially increased by mere growth of population.

In the course of forest reserve settlement enquiries in the tropics, conscientious attempts have sometimes been made to apply these rules: for instance, the phrase, "fuel for domestic use, but not for sale" is quite a usual one in reserve settlement judgments and in the texts of forest ordinances. More often the rules have been lost sight of, so that rights have been granted to individuals or to vague and fluctuating bodies of people like the inhabitants of a village, without any ruling as to whether they are heritable or how far they may be used commercially. Within a generation a dozen households may start to use a domestic fuel right intended only for one in the first place and a dozen shepherds may become engaged on commercial stock raising under cover of a right granted originally to a single person for his domestic animals.

During extensive phases of land use the problem is a difficult one and no satisfactory solution has yet been put forward. The arbitrator is handicapped by the lack of any permanent landed property to which he can tie forest rights and this is likely to continue until agriculture becomes settled and land begins to be regarded as a permanent form of individual wealth.

Dry Woodlands of Africa South of the Sahara

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This article is a condensation of the chapter on Africa from a forthcoming FAO monograph on acacias and related species. The chapter has special significance for the working party on forestry in savanna areas set up by the first session of FAO's African Forestry Commission. There are three other relevant FAO publications:

Tropical Silviculture, *Volume I (Forestry and Forest Products Study No. 13) which contains an interesting section on the dry deciduous forest, of which the savannas constitute an important part;*

Tree Planting Practices in Tropical Africa (*Forestry Development Paper No. 8*) *particularly as to seed, nursery, and planting operations, and the section on selection of species; and*

Choice of Tree Species (*Forestry Development Paper No. 13*) *especially as to tropical lowland climates.*

The dry woodlands of Africa, south of the Sahara, occur in two zones and together occupy an area of over 5 million square miles (13 million square kilometers).

The first area is a long comparatively narrow strip in the Northern Hemisphere which extends roughly from the Atlantic Ocean in the west to the Indian Ocean in the east in the Horn of Africa. This strip occupies about 2 million square miles (5.2 million square kilometers) and is about 3,500 miles from west to east (5,600 kilometers) and about 600 miles (1,000 kilometers) from north to south. It lies roughly between latitude 5°N. and 23°N. Its vegetational characteristic is the predominance of *Acacia* species particularly in the center and the east. The only indigenous *Prosopis* species of Africa (*P. africana*) occurs throughout most of the belt.

The second area is in the Southern Hemisphere and is a roughly circular area of some 3 million square miles (7.75 million square kilometers) in Central and South Africa. It occurs mainly in Tanganyika, Nyasaland, Northern and Southern Rhodesia, the Congo, and in Angola and Mozambique. It lies roughly between latitudes 5°S. and 17°S. Its vegetational characteristic is the lack of importance of *Acacia* species (except for *Acacia albida*) and the predominance of the *Brachystegia-Isoberlinia-Julbernardia* complex of many species.

In these areas the woodlands are usually of vital importance to the local population (as in Somalia) or to large local industries such as the Copper Belt of Northern Rhodesia and the Congo.

These African woodlands have been considered by the Commission for Technical Co-operation in Africa South of the Sahara (CCTA) and the Scientific Council for Africa (CSA), by a committee of the CCTA Pointe Noire Conference in 1958, and by a meeting of specialists set up by the Pointe Noire Conference, at N'dola in Northern Rhodesia in 1959. Among other things, this latter meeting listed 80 of the more important species of the African woodlands about which it considered that detailed information should be collected and on the silvics and silviculture of which research should be directed.

The list of species decided on by the N'dola Conference is as follows:

Acacia albida, A. campylacantha, A. nigrescens, A. sieberiana, A. tortilis
Adansonia digitata
Afrormosia angolensis
Afzelia quanzensis
Albizzia adianthifolia, A. antunesiana, A. versicolor
Anogeissus leiocarpus
Baikiaea plurijuga
Berlinia giorgii
Brachystegia allenii, B. boehmii, B. bussei, B. floribunda, B. gossweileri, B. longifolia, B. manga, B. microphylla, B. spiciformis, B. tamarindoides, B. taxifolia, B. utilis, B. wangermeeana.
Burkea africana
Canarium schweinfurthii
Chlorophora excelsa
Chrysophyllum bangweelense
Colophospermum mopane
Combretum laxiflorum, C. molle, C. mechovianum
Commiphora mollis
Cryptosepalum pseudotaxus
Daniella alsteeniana
Dialium englerianum
Entada abyssinica
Entandrophragma delevoyi
Erythrophleum africanum, E. guineense
Faurea saligna
Guibourtis coleosperma
Isoberlinia angolensis, I. dalzielli, I. doka, I. tormentosa
Julbernardia globiflora, J. paniculata
Kirkia acuminata
Lophira alata
Marquesia acuminata, M. macroura
Monotes kerstingii
Oldfieldia dactylophylla

FIGURE 1. – *Tropical and subtropical dry forests.*

Ostryoderris stuhlmannii
Parinari curatellifolia (*mobola*), *P. excelsa*, *P. polyandra*
Philippia bengualensis
Piliostigma thonningii
Pseudoberlinia baumii
Pseudolachnostylis maprounifolia
Pteleopsis anisoptera, *P. myrtifolia*
Pterocarpus angolensis, *P. chysothrix*, *P. stevensonii*
Ricinodendron rautanenii
Sclerocarya caffra
Sterculia quinqueloba
Syzygium guineense
Terminalia mollis, *T. sericea*
Uapaca nitida, *U. kirkiana*, *U. somon*
Zeyherella magalismontana

To this list should be added *Prosopis africana* (Africa's only indigenous *Prosopis*) which occurs generally in Senegal, Gambia, Guinea and countries north of the Equator but south of the Sahara, right across the Northern Belt and even into Uganda. *Prosopis fischeri* (the *Pseudo-prosopis fischeri* of the Tanganyika check list) might also be included. It is a miombo * species found in the Congo and Northern Rhodesia but it is probably not a *Prosopis* species at all.

In the following sections some of the typical woodlands of Africa are described in some detail.

Northern Nigeria Savanna

The Nigerian dry forests extend over some two thirds to three-quarters of the area and cover about 350,000 square miles (900,000 square kilometers), roughly 700 miles (1,100 kilometers) from east to west and some 500 miles (800 kilometers) from north to south. The rainfall varies from about 10 inches (250 millimeters) to 40 inches (1,000 millimeters) and there is, in general, a rainfall gradient from north to south.

Temperatures are not particularly severe (as is usual in similar dry forests further to the east), and it is rarely that they go over 105°F. (41°C.) or under about 45°F. (7°C.). The woodland formations are usually at altitudes from sea level to about 3,000 feet (900 meters) and are characterized by a long dry season and considerable fire hazard. Keay in several publications since 1949 has differentiated this general vegetation type into a number of subtypes. Going north from the wetter forests to the drier woodland he distinguishes the following zones: (*1*) Southern Guinea, (*2*) Northern Guinea,

* "Miombo" is a Tanganyika-Swahili word which originally was used for one species (*Brachystegia boehmii*) but it is now used for all the combinations of the *Brachystegia-Isoberlinia-Julbernadia* complex.

(*3*), Sudan and (*4*) Sahel. These general vegetation zones were described for the savanna regions of West Africa by the French botanist Professor Chevalier in 1900 and, apart from comparatively minor modifications, his differentiations are still recognized.

Southern Guinea zone

Typical species are *Daniellia oliveri*, *Hymenocadia acida*, *Vitex doniana*, *Detarium senegalense* and *Afzelia africana*. The typical vegetation is an open savanna woodland with trees up to 40 to 50 feet (12 to 15 meters) high with short boles and broad leaves. Heights of up to 100 feet (30 meters) are sometimes but rarely found. A characteristic of the type is that of fierce fires in the dry season. Most of the species have a thick bark capable of resisting grass fires and they possess remarkable powers of sending up fresh sucker growth after the fires.

Northern Guinea zone

This zone is a northwestern extension of the miombo (*Brachystegia-Isoberlinia*) woodlands of East and Central Africa. The main species are *Isoberlinia doka*, *I. tomentosa*, *Monotes kerstingii*, and *Uapaca somon* while *Swartzia*, *Combretum*, *Protea*, *Lannea* and *Paronari* also occur. This vegetation is some 30 to 45 feet (9 to 14 meters) high and the tree crowns are almost touching. After felling there is usually profuse regeneration from coppice and suckers.

Sudan zone

This zone is generally covered by a drift of sand over gneisses and other igneous rocks. Typical species are, of the larger trees 25 to 50 feet (8 to 15 meters) high, *Anogeissus*, *Sclerocarya*, *Balanites*, *Lannea* and *Prosopis africana*, and of the smaller trees up to 20 feet (6 meters) high, *Combretum*, *Strychnos*, *Acacia senegal* and *A. seyal*.

Sahel zone

This zone occurs in the extreme northeast of the group and is comparatively small in area. The rainfall is generally less than 20 inches (500 millimeters). The vegetation is up to about 30 feet (9 meters) high. Typical tree species are *Acacia raddiana*, *A. senegal*, *A. seyal*, *A. laeta*, and *Commiphora africana* with shrubs of *Salvadora*, *Leptadenia* and several species of *Grewia*.

These vegetation types are vital to the local population for their fuel and charcoal, building poles, and fodder for their animals. They also have a great shelter and soil conservation value. Some minor products such as gum are harvested. They are essentially "local" woodlands.

The management of these dry areas is usually that of clear felling controlled by area and the regeneration is by coppice and suckers. Fire is the great danger and in the north is controlled by deliberate early burning.

In many parts of the savanna, artificial regeneration by plantations has been attempted, but this work must still be considered to be in its infancy. Species that have been successful so far are *Azadirachta indica*, *Gmelina arborea*, *Tectona grandis*, *Cassia siamea*, *Dalbergia* spp., *Eucalyptus* spp. The object of management is the production of fuel and poles on a short rotation of about 10 years.

In the natural savanna the rotation is usually from 20 to 30 years. Yields are generally low but very variable from 1.5 to 15 cords per acre (200 to 1,900 stacked cubic feet per acre or 2 to 22 stacked cubic meters per hectare).

Sudan Dry Woodland

The Sudan covers an area of nearly 1 million square miles (2.6 million square kilometers) and is included between latitude 4°N. and 22°N. and longitudes 22°E. and 39°E. Most of the woodland is in the southern two thirds of the country. The rainfall of this woodland area generally speaking increases as one goes south from about 8 inches (200 millimeters) to about 50 inches (1,400 millimeters). Most of the rainfall comes in the summer months of May to October. Temperatures are extreme and vary from about 120°F. (49°C.) in the hot weather to frost or near frost in the cold weather. The general elevation of these woodlands is from 1,000 to 3,000 feet (300 to 900 meters).

Going from north to south, we have in general clay plains in the east and sands in the west in the more northerly areas, and red ironstone soils in the south and southwesterly areas.

Smith (1949) divides these *Acacia* woodlands into a number of types:

1. *Desert* down to a rainfall as low as 2 inches (50 millimeters) with *Acacia flava* (syn. *A. ehrenbergiana*) as the type species: on favorable sites associate species are *Capparis*, *Maerua* and *Leptadenia*.

2. *Acacia desert scrub*. This formation stretches from 2 inches (50 millimeters) rainfall westwards to about 17 inches (400 millimeters) on the clays and heavy loams and about 10 inches (250 millimeters) on the sands. The type species is *Acacia tortilis* and with it often occur *A. raddiana*, *A. flava*, *Maerua*, *Capparis* and *Boscia*.

3. *Acacia short grass country*. In this formation *A. mellifera* is the type species on the clay soils and *A. senegal* (which yields the true gum arabic) on the sands. Other associated species are *Albizzia*, *Commiphora* and *Combretum*.

4. *Acacia tall grass country*. This formation usually occurs in rainfalls of about 18 to 35 inches (450 to 900 millimeters): the type species on the dry soils are *A. mellifera*, *A. fistula*, *A. senegal*, *A. seyal* and *Balanites aegyptiaca*.

5. *Mixed deciduous fire-swept forest.* In this type, a wetter type, the main acacia is *A. campylacantha.* Associate species are *Tamarindus, Anogeissus, Piliostigma, Sclerocarpa, Albizzia. Prosopis africana, Isoberlinia doka* and *Uapaca* spp. often occur in this zone.

Smith (1949) also lists the type species by rainfall and soils thus:

Rainfall in. (mm.)	*Type species*
	All on clays
4 (100)	*Acacia flava, A. orfota, A. tortilis, A. raddiana.*
8 (200)	*A. mellifera, A. fistula* (syn. *A. seyal* var. *fistula*), *A. senegal* (syn. *A. verek*), *A. seyal, A. drepanolobium, A. campylacantha, A. sieberiana* (syn. *A. verugera*), *A. albida, A. hebecladoides, A. seyal* var. *multijuga.*
47 (1,200)	*A. abyssinica.*
	On red ironstone soils
40 (1,050)	*A. hebecladoides, Isoberlinia doka, Vitex cuneata, Prosopis africana, Anogiessus schimperi, Strychnos spinosa.*
55 (1,400)	*Erythrophleum guineense.*

These woodlands are of extreme importance to the local peoples and their animals. They also have an important soil conservation value. They are worked for their fuel, charcoal, fodder, and minor products such as the gum arabic from *A. senegal.*

Regeneration is usually natural by seed, suckers or coppice. Two species that are reproduced artificially are *Prosopis juliflora* which does well in light soils in a rainfall as low as 4 inches (100 millimeters) and *A. arabica* (the babul of India) which likes river land which is subject to inundation. Both these species have many uses.

The main danger to these woodlands is fire, and they owe their purity to their superior fire resistance. *A. seyal* resists the heaviest fires by its fleshy bark. *A. mellifera* suppresses in its shade the grasses which the soils and rainfall are suited to growing. *Erythrina tomentosa, Cussonia arborea, Diospyros mespiliformis* and *Balanites aegyptiaca* resist fire by extreme formation of corky bark.

Acacia-Commiphora Scrub Woodland of the Horn of Africa

This area covers the Republic of Somalia and the Ogaden area of Ethiopia. Together they make up what is commonly called the Horn of Africa, and hence are considered together. Generally speaking the area is inhabited by pastoral nomads who are entirely dependent on the scrub for their day-to-day existence, and that of their animals. The former Somaliland Protectorate and Somalia are well described by Lawrie (1954) and Mooney (1958 and 1959). Little is on record of the Ogaden of Ethiopia and figures are not available.

The most northern area is approximately 70,000 sq. miles (110,000 sq. km.) and lies between latitudes 8°N. and longitudes 43°E. and 49°E. South is a coastal strip which runs down to Kenya about 200 miles (325 km.) wide and some 1,000 miles (1,600 km.) long. It lies between latitudes 12°N. and 2°S. and longitudes 41°E. and 51°E. The Ogaden of Ethiopia fills in the western boundary and is of about the same area as was Somaliland. The nomadic pastoralists know no political boundaries and wander from area to area.

Interesting figures of the population, human and animal are given below:

Former Somaliland Protectorate	*Former Somalia*
Area: 68,000 square miles (110,000 square kilometers)	Area: 185,000 square miles (460,000 square kilometers)
Population: 700,000	Population: 1,250,000
Camels: 1.2 to 2.5 million	Camels: 1.4 million
Cattle: 1.2 million	Cattle: 850,000
Sheep: 2.4 million	Sheep: 650,000
Goats: 1.6 million	Goats: 3 million

The annual rainfall is meager and erratic and in general about 10 inches (250 millimeters) even falling as low as 2 inches (50 millimeters). At higher elevations it may be as much as 25 inches (650 millimeters) and in favorable situations in the hills may even reach 40 inches (1,000 millimeters).

The altitude of the area is roughly from sea level to about 2,500 feet (760 meters). Temperatures are extreme and may be up to 110°F. (43°C.) in the hot weather with near frost temperatures in the cold weather. Very long, completely dry hot spells are the rule.

The species are in general *Acacia* and *Commiphora* very rarely over 10 feet (3 meters) high. In Somalia the most important acacias are probably *Acacia bussei, A. tortilis, A. spirocarpa,* and *A. etbaica.* These are associated with *Dobera, Salvadora, Boscia, Cadabra, Maerua, Balanites, Zizyphus,* and *Dichrostachys* species which often assume local importance. In Somaliland the important species are *Acacia bussei, A. mellifera, A. senegal, A. misera, A. spirocarpa, A. etbaica, A. arabica, A. circummarginata,* and *A. unispinosa.*

Logan (1946), lists as occurring in or introduced into central and southern Ethiopia, *Acacia abyssinica, A. albida, A. farnesiana, A. nilotica, A. seyal,* and *A. stuhlmanii.*

Little or nothing is known of the insect, fungal or virus pests and diseases of these areas nor of the growth and yield.

The main needs of forest development of these areas have been stated by Mooney (1959) as follows:

(*a*) the protection and management (including range management) of some of the better quality *Acacia* areas especially near towns to serve as shelterbelts

FIGURE 2. – *Deformed* Brachystegia *forest coppice on poor site.*

Courtesy: *Figures 2 to 5, C. R. Hursh, ICA*

FIGURE 3. – Julbernardia *forest on medium good sites. Regeneration depends on full fire protection. Dzalanyama Forest Reserve, Nyasaland.*

and a permanent source of firewood and charcoal on a sustained yield basis (*A. bussei*, *A. spirocarpa*, and *A. tortilis* are suggested);

(*b*) improvement of pasture and browse outside the forest reserves by means of rotational grazing and the provision of water tanks at suitable widely separated points to disperse the livestock and spread out the incidence of grazing;

(*c*) the improvement of the frankincense, myrrh and gum arabic business;

(*d*) protection of the country against soil erosion;

(*e*) the conservation of a scanty and capricious rainfall.

This semidesert scrub woodland is of extreme importance for its soil conservation properties and its destruction would be catastrophic. The rapidly increasing population, both human and animal, make the danger of its destruction more serious and more imminent.

The woodland is used chiefly for pasture and browse and for the building of temporary huts, cattle pens, firewood and charcoal by the nomads. A detailed list of the uses of the many acacias in Somaliland is given by Lawrie (1954). In addition, there are some minor products from this area, the trade in which is thousands of years old. Frankincense from *Boswellia* species, myrrh from *Commiphora* species, and gum arabic from *Acacia senegal* are all mentioned in the year 500 B.C. by Herodotus who, talking of the Red Sea trade, said that it was in the hands of Egyptian and Phoenician traders. He also mentions cinnamon and cassia (senna pods) from South India.

Acacia-Commiphora Scrub Woodland of the Northern Frontier Province of Kenya

The northern frontier of Kenya occupies an area of 117,000 square miles (300,000 square kilometers) out of a total area of the territory of 220,000 square miles (560,000 square kilometers), i.e., it is some 53 percent of the territory (1948 Population Census published by the Kenya Government in 1953). Its northern boundary for some 500 miles (800 kilometers) is contiguous with the Ethiopian border and it extends south for about 200 to 300 miles (325 to 500 kilometers). It is generally between latitudes 1°N. and 4°N.

It lies at a general elevation of 1,000 to 2,500 feet (300 to 750 meters) but contains occasional high ground up to 8,000 feet (2,400 meters). The general rainfall is from 8 to 30 inches (200 to 750 millimeters) but most of the area is in the 8- to 15-inch belt (200 to 375 millimeters). This rainfall is very variable and there is a fluctuation of about 50 percent about the mean. Temperatures are extreme and vary from over 100°F. (38°C.) to near frost. The rain usually occurs in heavy thunderstorms and very long dry hot spells are normal.

The vegetation of the area may be described as a semidesert thorn scrub. It consists of *Acacia* spp. of which *A. drepanolobium* is frequent, *Commiphora* spp., *Phyllanthus* spp., *Euphorbia* spp., *Salvadora persica*, *Dodonea viscosa* and sagebrush (*Atriplex* spp.).

Silviculture is scarcely practiced in the area and the management is an attempted control of the nomadic pastoral population that is dependent on the vegetation (as in the Somali Republic already described).

Little or nothing is known of the insect and fungal pests (except locusts). Fire is not a hazard as the scrub is too open generally to permit continuous fires.

This scrub woodland is extremely important to the local nomads as they and their animals are entirely dependent on it for their day-to-day existence. It also has another very important effect on the economics of Kenya. The vegetation supports a large population of wildlife and game such as elephant, rhino, buffalo, pig, kudu and lion. This attracts tourists, both hunters and photographers, from all over the world and hence is a very important economic asset.

The need for the protection, conservation and management of this large area is shown by the fact that eland, zebra, oryx, buck and ostrich are rapidly disappearing. It is a question of the survival of the biggest, the roughest and the toughest both in fauna and flora.

FIGURE 4. – *Defective stands on damaged sites. Rehabilitation requires complete exclusion of livestock for several decades following clear-cutting and introduction of herbaceous vegetation. A serious problem-condition of dry woodlands.* Brachystegia *in Mzimba District, Nyasaland.*

MIOMBO WOODLANDS OF CENTRAL AFRICA

These combinations of the *Brachystegia-Isoberlinia-Julbernardia* complex form a compact area of some three million square miles (7,750,000 hectares) in central and south central Africa — probably one of the largest compact areas of one forest type in the world. It occurs between latitudes 5°S. and 25°S. and hence is practically wholly in the southern tropics. From west to east at its greatest width it stretches almost from the Atlantic Ocean to the Indian Ocean. It occurs in Southern Tanganyika, Nyasaland, Northern Rhodesia, Southern Rhodesia, the Congo, Mozambique to the east, and Angola to the west. It also extends in a modified form into South Africa. It is typified in the woodlands of Northern Rhodesia which have a rainfall of some 45 inches annually (1,150 millimeters). This rainfall is very variable from 25 to 50 inches (625 to 1,270 millimeters). There is a long dry hot season of from six to eight months. Temperatures vary from 60°F. to 80°F. (16°C. to 27°C.) in the cold season although there is occasional frost, to 80°F. to 120°F. (27°C. to 49°C.) in the hot season.

The general range of altitude is from 3,000 to 5,000 feet (900 to 1,500 meters).

The soils in this area are generally the following:

(*a*) red earth — sandy and sandy clay soils;

(*b*) plateau soils (with laterite) which usually carry the miombo woodland;

(*c*) Kalahari sands which carry the *Burkea*, *Baikiaea* and *Cryptocephalum* woodlands;

(*d*) upper valley soils which usually support maize;

(*e*) lower valley soils with low rainfall and extremes of temperature which usually carry mopane (*Colophospermum*), *Acacia* and *Combretum*;

(*f*) the lake basin soils (Chipya) which are in general used as the most suitable for the introduction of exotics.

The main species of the type have already been listed but they are in general of the genera *Brachystegia*, *Isoberlinia* and *Julbernardia*. In addition, the bamboo *Oxytenanthera abyssinica* is common.

The silviculture of these woodlands is usually simple and the methods of working depend entirely on local conditions. For example, in the Copper Belt of Northern Rhodesia and the Congo the difficulty is to prevent the woodlands being destroyed, whereas in Tanganyika the difficulty is to find ways and means to work them. Yields are low and of the order of 50 cubic feet per acre (0.6 cubic meters per hectare) in forests that have been previously worked. The value of the produce is low also but it is absolutely essential if the mining of copper and uranium is to go on.

Little is known of the insect pests or of the mycological and virus diseases of these woodlands.

The general method of management is that of clear felling with natural regeneration by coppice and suckers. The rotation will probably be of the order of 100 years.

The clear felling is followed by strict fire protection. Complete fire protection is usually not possible and the system of " early burning " is generally followed. Intensive experiments on the effect of (*a*) complete fire protection, (*b*) early burning and (*c*) late burning, were started by C.E. Duff in 1933. These have been evaluated by Trapnell and written up in the *Journal of Ecology* in 1959, that is, after 26 years.

Utilization in these woodlands varies enormously. In the mining area of the Copper Belt of Northern Rhodesia and the Congo, as mentioned above, the difficulty is to stop massacre of the woodland whereas, for example, in Tanganyika the difficulty is to find utilization.

It must be emphasized that in copper mining very little timber is used as conventional pitprops. The *Brachystegia* is used as baulks often in the round, in sizes about 12 by 12 inches (0.3 by 0.3 meter) and some 12 to 16 feet (3.5 to 5 meters) long. *Baikiaea* is used in smaller sizes and usually for railway sleepers in the underground electric railway. It is often used green and untreated and has survived many years under appalling conditions of alternating wetness and dryness.

Another essential use of local timber in the copper mines is that of " smelter poles " (which must be freshly felled and green) for the de-oxygenization of the ore in its initial smelting. These are used about 22 feet (6.7 meters) long and of 12 to 22 inches (0.3 to 0.6 meter) diameter. They are often of " local " exotics such as *Acrocarpus*. In addition a large amount of fuel is needed in mining areas.

In Tanganyika, with no mining industry, these miombo forests have been developed for beekeeping (as is the case with the dry forests in southern Greece) and today Tanganyika is one of the largest exporters of honey and beeswax in the world. Most of the export goes to the Far East, particularly to Japan.

The Tanganyika miombo woodlands differ from those of Northern Rhodesia in that although they have the same general rainfall range of from 25 to 50 inches (635 to 1,300 millimeters), their range of elevation is much wider, being from about 1,000 to 6,000 feet (300 to 1,800 meters).

Another big difference is that the Tanganyika miombo contains a comparatively valuable species *Pterocarpus angolensis* (locally called muninga). This is, however, sparsely scattered but, owing to its value, its distribution and silviculture is being intensively studied. Except in areas like the Copper Belt, the utilization of miombo timbers (except such valuable species as *Pterocarpus angolensis*) is difficult. The main problems are (*a*) the low stocking, (*b*) the low proportion of valuable species and (*c*) the refractory nature of most miombo species. (The correct type of saws, good maintenance, sufficiently heavy equipment and adequate power are essential for both milling and woodworking.) Seasoning and preservative treatments are both difficult but essential.

Much information should be collected on the botany, silviculture, management and utilization of this extensive forest type. Initial work should be concentrated on:

1. *Information*
   Complete interchange of the information already in existence.
2. *Silviculture*

(*a*) Improvement of enumeration techniques.

(*b*) Effects of fire on regenerating exploited areas and on the quality of maturing timber.

(*c*) Effects of competition on the economically valuable species.

(*d*) Afforestation of miombo country with alternative species.

(*e*) Ecology of *Pterocarpus angolensis* with special reference to the possibility of obtaining a greater concentration.

(*f*) Artificial regeneration of *P. angolensis*.

3. *Utilization*

(*a*) Increased use of secondary species particularly *Brachystegia* spp. and *Isoberlinia* spp.

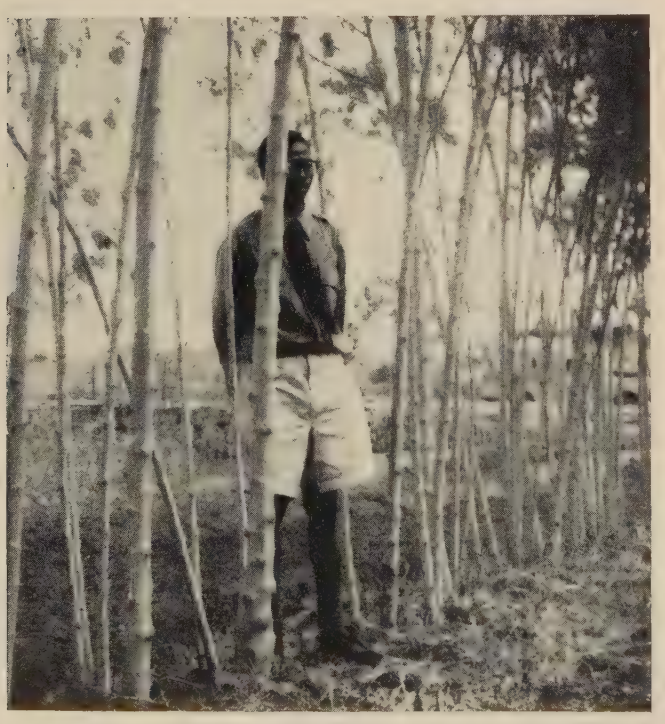
(*b*) Improved efficiency of haulage to counter the present low stocking of useful timber.

(*c*) Mobile milling to reduce the amount of waste material (sawdust and off cuts) hauled.

4. *Beekeeping*

This is being extensively studied in Tanganyika and the work should be extended.

FIGURE 5. – Sesbania *poles one year from seed. Selected varieties being tested at Namilombwa nursery.*



CHIPYAS OF NORTHERN RHODESIA AND THE CONGO

In the previous subsection on the miombo woodlands, it has been stressed that the yield is low and that in mining areas such as the Copper Belt the demand for forest produce is very high. Many attempts at replacing the miombo by fast-growing exotics have been made, many exotic species have been tried and many failures have been experienced. This has resulted in an intensive study of soil conditions. So far, the most successful results have been obtained on the chipya areas. ("Chipya"

is a Bantu word that means "heavily burned." It is either applied to a particular type of soil or to the vegetation that grows on it.)

The vegetation usually consists of various trees other than *Brachystegia* and *Isoberlinia* which grow mixed in very tall grass (hence the fires). The botanical evidence shows, from the evergreen nature of the relicts, that this type of vegetation was once much more extensive. Such species as *Syzygium*, *Steganthus*, *Chrysophyllum* and even *Entandrophragma* occur. There are also scattered stands of *Marquesia* which give way to *Brachystegia hockii* woodland and fringes of *Uapaca* spp.

Beneath the surface, which is often quite different from the lower layers, is a deep gray-brown to chocolate-colored, or even blackish humic soil with a rather loose structure possessing a definitely sandy base, which is so richly humic as to be termed a loam. It is a definitely acid soil (Trapnell, 1953) with a *p*H value of 4.2 to 4.8 in the first two feet (0.6 meter).

The most promising exotics tried so far (after some 25 years' experience) are *Pinus insularis* from the Philippines, and *P. michoacana* from Mexico. But mention must also be made here of the introduction trials with eucalypts. The most successful species to date are *Eucalyptus citriodora* and *E. saligna* (this is, however, of South African origin and is therefore probably a hybrid of *E. saligna* and *E. grandis* with the latter greatly predominating). The eucalypts are raised by a technique locally called chitimene which corresponds to the rab method of India. It consists of a clear felling of indigenous bush followed by a collection and stacking of the slash in either groups or contour strips. This slash is then burned and the eucalypt seed is sown broadcast in the resulting ash accumulations. This method is often combined with the raising of field crops such as millet, ground nuts and beans. It is in effect a modified taungya technique. The local names are quoted as they are often found in literature without explanation.

Rhodesian Teak Woodlands (Baikiaea plurijuga)

These forests and woodlands have been ably described by Martin (1940), and by Watson (1950) in his working plan for the period 1951 to 1957. The species which belongs to the family *Caesalpiniaceae* is, of course, not to be confused with the true teak of Asia (*Tectona grandis*). It is confined more or less to the deep sands of Northern and Southern Rhodesia, northern Bechuanaland and the Kaprivi strip, and southeast Angola. This region is the northern continuation of the Kalahari region of South Africa and was part of a late tertiary desert that covered the greater part of southern Africa. In the southwest of Northern Rhodesia it occupies some 11,000 square miles (28,000 square kilometers) in Barotseland. These Barotseland woodlands lie approximately between latitudes 16° S. and 18° S. and longitudes 23° E. and 25° E.

The rainfall is approximately 20 inches (500 millimeters) but is very variable and can be from about 12 inches (300 millimeters) to 40 inches (1,000 millimeters). The temperature varies from mean maxima of 90° F. to 95° F. (32° C. to 35° C.) in winter. In summer, extremes of 110° F. to 120° F. (43° C. to 49° C.) have been recorded and in winter severe frosts may occur locally. The general altitude is from 3,000 to 4,000 feet (900 to 1,200 meters).

Martin (1939), as a result of many analyses, divided the soils into two types:

(*a*) upper Kalahari sands, coarse and relatively uneroded, having about 20 percent fine sand in the top foot, low water-retaining power, capillarity and water table, and therefore able to support only a relatively poor open savanna woodland;

(*b*) lower Kalahari sands, eroded, with up to 50 percent fine sand in the top foot, high water-retaining power, capillarity and water table and therefore able to support a well-grown comparatively closed forest.

The feature of these forests and woodlands is the almost pure nature of the *Baikiaea plurijuga* stands whether as forest, woodland or savanna. In some of the better areas stands of up to 50 stems per acre (20 per hectare) occur with clean almost cylindrical boles up to 35 feet (11 meters) of the total height of some 60 to 65 feet (18 to 20 meters). There is a dense deciduous undergrowth of woody climbers and scramblers chiefly of *Combretums*, *Canthiums* and *Dalbergia glandulosa*. Grass and herbaceous growth are almost absent. *Pterocarpus stevensonii* often occurs as a subdominant and sometimes as a codominant.

In this woodland type (as opposed to the forest type) Martin distinguishes (*a*) a mixed woodland where the *Baikiaea* has as associated species *Copaifera coleosperma*, *Burkea africana*, *Pterocarpus angolensis*, *Ricinodendron rautanenii* and occasionally *Brachystegia spiciformis*, and (*b*) a pure woodland with few tree species other than the *Baikiaea*. This has a dense undergrowth but no climbers.

The exploitation of these woodlands has been through selection felling and the main effect of this has been the destruction of the fire-resisting qualities of the natural forest. The canopy is broken or removed, crown slash and branch wood is left on the ground and a heavy crop of grass comes in annually. This has necessarily led to a need for a fairly intensive fire protection by (*a*) patch burning (early burning), (*b*) boundary fire protection by external fire lines and (*c*) concentrated fire protection by internal fire breaks.

Full seed years occur at intervals of two to four years and abundant seed is produced. Trees in the open flower annually. The pods burst with a sharp report and the seed is flung to a distance of some 35 yards (32 meters). No other means of dispersal is known; the seed does not float and is destroyed if eaten by birds or animals. The tree starts to seed at about 30 years of age. The seeds are about 90 percent viable and germination is rapid when the rains break,

Regeneration is often profuse but rodents eat the seed and young seedlings. This, combined with dry season casualties, often results in poor survivals after a year. The seedling sends down a long taproot which reaches a depth of six feet or more at the end of the first rains. At maturity this taproot may be 30 feet (9 meters) or more in depth. Growth above ground is slow and may be 5 inches (13 centimeters) in the first year and 12 inches (30 centimeters) in three years. Stumps under 12 inches (30 centimeters) in diameter coppice and sucker freely. Coppice and sucker regrowth is however usually inferior.

Little is known of the insect pests and the fungal and virus diseases of the species. Fire is the main danger and may cause a dieback of the seedlings year after year. Late fires do most damage. Early fires tend to die out at the forest edge.

Yields up to 450 cubic feet per acre (5 cubic meters per hectare) over quite large areas have been recorded but an average figure of some 60 to 100 cubic feet per acre (0.5 to 1 cubic meters per hectare) is probably more normal.

The wood of *Baikiaea* is hard, heavy, close-grained and durable, brown when first cut and turning red-brown on exposure. Its air-dry weight is 53 to 60 pounds per cubic foot (0.7 to 0.8 kilogram per cubic meter). It is moderately easy to work and takes a fine finish which together with its hard-wearing qualities makes it a valuable and durable flooring timber. Owing to the remoteness of the forests, *Baikiaea* can only be exploited on a large scale for railway sleepers. The heartwood which forms about 80 percent of the mature log is immune from borer and termite attacks and durable in contact with the soil. The sapwood takes preservative well, but the heartwood is very refractory. In Rhodesian Railways' tests *Baikiaea* sleepers have shown a minimum life of 15 years. Sleepers put in green and untreated have done extremely well underground in the copper mines.

The output of *Baikiaea* sawn timber by the Zambesi sawmills in 1938 (as an example) was:

	cu. ft.	m^3
Railway sleepers	900,000	(25,000)
Flooring strips and blocks	70,000	(2,000)
Other uses	250,000	(7,000)

The working plan quotes annual yields from 1931 to 1948 varying from 1 to 1.5 million cubic feet (42,000 cubic meters) to over 3 million cubic feet (85,000 cubic meters).

As a final comment on these somewhat remote and comparatively unknown woodlands the following is quoted from the working plan:

> "The dependence of the Barotse on their forests is very considerable not only to supply their needs but also to maintain the soil fertility of the sands on which they grow their food crops."

The position is fully discussed by Martin (1941) in his *Report on forestry in Barotseland.*

Southern Rhodesia Mopane Woodlands

This species, *Colophospermum mopane* (formerly known as *Copaifera mopane*), sometimes grows to a height of 50 feet (15 meters) or more, and commonly to about 30 feet (9 meters).

In general, it is found in a peripheral belt of Southern Rhodesia but it extends into neighboring countries such as Northern Rhodesia, the southern province of Nyasaland, Bechuanaland and the northeastern Transvaal of South Africa. Its range is roughly from about latitude 15° S. to the Tropic of Capricorn. It is impossible to estimate the area of the type with reasonable accuracy.

It occurs in a rainfall of some 15 to 40 inches (375 to 1,000 millimeters). Temperatures are fairly extreme and vary from a few degrees of frost in the cold weather to over 100° F. (38° C.) in the hot weather. Long periods of drought are the rule rather than the exception and a dry period from April to November usually occurs. The altitude of the type varies from about 1,000 to 4,000 feet (300 to 1,200 meters).

The type is not usually found on the Kalahari sands, but on basalt outcrops in the general area of the sands. The general outward appearance of the mopane soils is that of infertility. The first few inches of soil show a *p*H of over 6 and from there down to some 6 feet (2 meters) it is extremely alkaline with a *p*H often over 8.

The forests are essentially local and there is no protection, silviculture or management of the type in Southern Rhodesia.

The type owes its survival to its great resistance to fire and its ability to reproduce itself by coppice and suckers. This reproduction is often slow to "get away". It flowers and fruits irregularly.

The species normally occurs reasonably pure due to its ability to withstand fire, extremely poor soil drainage and the high *p*H of the soil. When not growing pure, commonly associated species are: *Adansonia digitata* (baobab), *Brachystegia boehmii*, *Kirkia acuminata*, *Acacia nigrescens* and *Commiphora* species. Occasionally one finds *Afzelia quanzensis*, *Albizzia anthelmintica* and *Combretum* spp. as associates.

The wood is normally used for local fence posts and firewood. The heartwood is dark red to almost black, and is heavy, hard and durable. Air-dry it weighs about 75 pounds per cubic foot. It is suitable for railway sleepers and flooring blocks. It is extensively used for mining purposes (Pardy, 1953). The leaves have a browse value, and the tree is of great use for protection against soil erosion.

With the recent rapid increase in population and modern agricultural methods which have shown that maize and millets can be grown marginally on these lands, the type is likely to disappear and it is urgent that land use in these mopane areas be put on a sound basis.

The rate of growth of mopane is slow, probably even slower than that of *Brachystegia* or *Baikiaea*. A good

average d.b.h. increment figure is about 0.1 inch (3 millimeters) per year under conditions of ordinary competition and a comparable volume increment figure is about 5 cubic feet per acre per year (0.06 cubic meter per hectare per year).

Little is known of the insect and fungal pests and diseases of this type, but a very high proportion of mopane trees in Southern Rhodesia are unsound. Hollow boles are common and obvious holes in the stems are even more common. This damage is commonly attributed to fire, but it is more likely to be caused by dieback of the branches followed by heart rot, the former being associated with progressive deterioration of soil conditions (Hodgson, unpublished, 1960).

Prosopis in South and South West Africa

The position is well described by Jurriaanse in an undated memorandum on fodder trees. In this paper he discussed the merits of other species such as *Gleditsia* spp., *Zizyphus* spp., *Bauhinia* spp., *Capparis* spp., *Tarchonanthus* spp., *Salix* spp., *Grewia* spp., *Rhus* spp., *Acacia giraffae* (Camel thorn), *A. albida* and various other acacia species, *mopane* (*Colophospermum mopane*).

A number of *Prosopis* species were introduced into South Africa from the drier southwestern areas of the United States and from Mexico to Chile where they grow under rather similar conditions to those of *Acacia karoo* in South Africa.

Prosopis species were introduced before 1900 and they soon adapted themselves in the drier areas such as the Karoo, Namaqualand and South West Africa. They spread to such an extent both artificially and naturally that today they are regarded as being indigenous. The records of the original introductions have been lost and the *Prosopis* has hybridized so that today it is almost impossible to distinguish species, let alone seed origins.

Under favorable conditions the *Prosopis* develops into fairly large trees reaching a height of some 50 feet (15 meters) with stem diameters of 3 feet (0.9 meter). In southern Africa *Prosopis* does not thrive in high rainfall areas but appears to like a rainfall of about 10 to 20 inches (250 to 500 millimeters) per year. *Mesquite*, the world accepted name for *Prosopis* species, prefers soils with a high mineral content. It also likes lime soils in a low rainfall.

In South and South West Africa the main object is the fodder value of the pods and provided that heavy bearing strains can be developed, *mesquite* promises to be the ideal fodder tree for arid regions as it can be propagated under conditions where practically no other fodder crop can be raised (Jurriaanse). *Ceratonia saliqua* (the carob bean of the Middle East) needs to be tested more adequately in the dry areas of Africa south of the Equator.

Little is known of how these fodder species should be raised with reference to the stock that they should benefit by their food and shelter. Should they be in irregularly arranged copses or should the arrangement be regular in lines or otherwise? Annual crop yields of fodder of *mesquite* vary from about 200 to 500 pounds (90 to 225 kilograms) per tree.

Prosopis is well acclimatized in some parts of the low rainfall areas of South Africa and it is spreading naturally into the veld from undigested seed spread by stock so that it may become a pest, as has happened in other parts of the world, and it may have to be eradicated or at least controlled. This demonstrates the danger of indiscriminate introductions of possibly undesirable species and strains of the genus. The CCTA Phytosanitary Committee for Africa is well aware of this and is urging that all precautions practically possible be taken. It also emphasizes the need for careful consideration before introducing new species or new strains of the species into new areas. Many of the failures of *Prosopis* introductions have probably been due to using species or strains not suitable to the areas concerned.

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Conversion of Degraded Hardwood and Coppice Forests

The European Forestry Commission's second Study Tour on Applied Silviculture, held in the United Kingdom 20-30 June 1960, was devoted to the subject of converting degraded hardwood and coppice forests in order to increase productivity. Twenty foresters from nine countries studied in the field the work being done in ten different forests in southeast England, visited utilization plants which depend to a large extent on wood from these forests, and compared the methods seen with those used in their own countries.

The problem of conversion of degraded hardwood forests exists in all the participating countries in varying degrees, most extensively in the Mediterranean countries but also in the northern European countries. In general, the proportion of degraded woodlands is greater in private and communally owned forests than in those belonging to the State. The causes of degradation are basically the same in all countries although their order of importance varies: overgrazing, neglected or abandoned farms; changing markets (especially for firewood, pitprops and railway sleepers) and economic conditions leading to silvicultural neglect and to uncontrolled cutting; damage from fire, insects, disease, or wartime conditions.

Bringing back these forests to commercial productivity is an expensive problem. The urgency is provided in most cases by the rising demands of the pulp and paper and other wood-using industries. Conversion can be accomplished by a variety of methods. For example, high forest can be converted under shelterwood or by clear-felling methods. Regeneration can be achieved with original species, but generally a change to introduced species, often in mixture, is used. The choice of species and methods will be determined by a variety of factors including foreseeable market conditions and, of course, soil and climatic conditions. Coppice or coppice with standards may be converted with no extra planting or sowing, by the introduction of seed or transplants of the same or different species into gaps or under shelterwood, or by replanting or sowing after complete clearance in strips, groups, or large blocks. Combinations of several of these methods are often used.

The improvement of degraded hardwood forests is being encouraged by government action in many countries through legislation, technical assistance, and subsidies. The following papers give a picture of the situation in France and the United Kingdom.

A third Study Tour on Applied Silviculture, on the subject of silvicultural practices for farm woodlands, is to be held in Austria in 1961.

M.A.H.

Conversion of Degraded Hardwood Forests in France

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Out of a total land surface of 55.2 million hectares, France possesses 11.6 million hectares of forests, 21 percent of which is managed with the aid of grants from the National Forestry Fund. The division of this area by forest categories and by types of ownership is as shown in the Table.

Coppice and coppice with standards account for 37 percent of the forests under management by the State forest service, and 65 percent of private forests and forests not under systematic management. It is mainly on these latter areas that conversion is taking place.

There is a marked predominance of hardwoods (69 percent) over softwoods (31 percent) in French forests because the extensive areas of calcareous soils of high *p*H lend themselves to the production of hardwoods,

Ownership	Area		Coppice and coppice with standards		High forest conversion in progress		Unplanted land
	total (ha.)	%	area (ha.)	%	area (ha.)	%	
	Million hectares						
State	1.66	14	0.28	17	1.08	65	0.30
Communes and public bodies under forest management	2.38	21	1.23	52	1.08	45	0.07
Private forests and collective groups not under forest management	7.56	65	4.93	65	2.63	35	—
Total	*11.6*	*100*	*6.44*	*56*	*4.79*	*41*	*0.37*

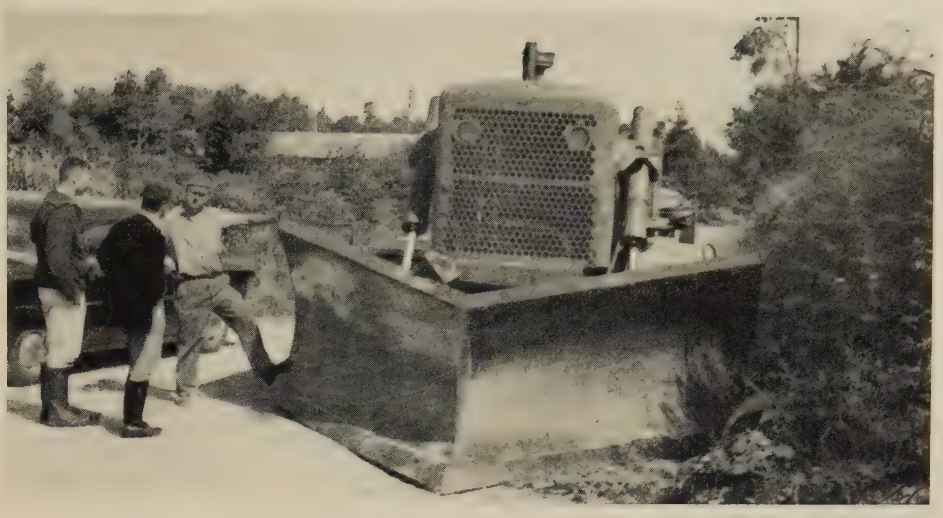

FIGURE 1. – *Strips are cleared in poor coppice by bulldozer with delta blade, and afterward subsoiled and gone over with a root rake.*

and the mean annual temperature of over 10°C. is more favorable to hardwoods than to the majority of conifers.

The large area devoted to coppice and coppice with standards is, however, due to economic reasons. France is a country which has little coal. Until comparatively recent times, wood was the principal domestic fuel and for part of the 19th century was also an industrial fuel (for smelting, glass manufacture, the manufacture of chemicals, etc.). Also until recently, most of the population was rural and naturally preferred to burn wood instead of coal, because countryfolk lived close to centers of wood production and could themselves cut the amount they required.

This situation has changed gradually since 1918 but at an especially marked rate since 1945. The consumption of firewood has fallen rapidly and is still falling annually. Today only 15 to 20 million cubic meters are used, of which 6 million are used industrially. At the same time, there has been a very marked decrease in the consumption of pitprops, mining timber, and wooden railway sleepers.

Whereas a number of other European countries converted their degraded forests during the 19th century when there was still a steady demand for firewood, for pitprops and railway sleepers, in France the forests are now having to be converted at a time when the market for small-dimension wood is becoming more and more difficult, which makes the operation expensive. However, there is a reason for optimism in that the pulp industry and the fibreboard and wood particle board industry every year use more and more home-grown wood of small dimensions. The consumption of small-sized home-grown timber by the pulp industry has risen from 500,000 cubic meters before the war to 3,015,000 cubic meters in 1959, which represents 10 percent of the total production of home-grown timber against 2 percent in 1939, and provides more than 50 percent of the requirements of the paper industry as against 14 percent before the war. This development has encouraged the rehabilitation of degraded forest and especially conversion to conifers. Moreover, coppice and coppice with standards no longer provide the revenue which private owners expect. The *communes* especially have suffered from loss of revenue. At the same time these forests can no longer provide opportunities for employment at a time when the population is increasing.

Again, France must import each year 4 million cubic meters of pulpwood (or the equivalent in pulp) and 2 million cubic meters of sawlogs (or the equivalent in sawn timber), quantities which may be exceeded 20 years from now by 10 million cubic meters for the paper industry and 3 million cubic meters for logs.

In view of this situation, the *Administration des eaux et forêts* has for some years now paid great attention to increasing the industrial timber resources of the country.

While allowing for the fuelwood needs of the *communes*, the Forest Service has gradually increased the number of standards in communal areas of coppice with standards, to the extent that in many cases, principally in the northeast, full conversion into high forest (of oak or beech) by natural regeneration has already been undertaken or is planned. At the same time coppice rotations have been lengthened from 15-20 years to 25-30 years and even to 40 years.

Then there are in France about 5,600,000 hectares of heathland and abandoned agricultural land. The reforestation of this land was encouraged by financial grants even before the war, but since 1947, with the advent of the National Forestry Fund, it has made remarkable progress. In fact reforestation — mainly with conifers, but also with poplars — of these barren areas has progressed faster than the conversion of coppice and coppice with standards to conifers. It is much easier and often much cheaper. Moreover, a large part of the heathland and abandoned areas is in the mountainous regions and on flinty soils particularly favorable to the creation of fast-growing and highly profitable conifer plantations.

From 1947 to 1959, more than 600,000 hectares have been reforested from the National Forestry Fund, which has been aiding enrichment and conversion of

FIGURE 2. – *Strip cleared in worthless coppice by a Traxcavator, tilled and ready for planting.*

coppice, and of coppice with standards only to a smaller extent. But the current trend is an increase in conversion of such forests to conifers, partly owing to the new mechanized techniques now developed and partly owing to the need to keep pace with the growing demands of the paper industry.

The National Forestry Fund aids by

(*a*) nonrepayable grants (1,500 N.F.[1] per hectare, given principally in the form of planting stock);

(*b*) long-term loans at 0.25 percent to 1 percent interest according to the method of repayment (maximum duration 50 years);

(*c*) contracts under which the Fund itself undertakes the execution and payment of the necessary work, recovering its expenses from the first fellings, at an interest of 0.25 percent.

In connection with the work of the Fund, one of the great obstacles was the small size of ownerships. Half of the 7,560,000 hectares of private forest is in ownerships of less than 50 hectares. 1,400,000 private owners have each less than 10 hectares of woodland. In some extreme cases, there are forested parcels of 3 meters in width by some hundreds of meters in length.

A law of December 1954 on the grouping of forest properties allowed the setting up of private companies especially for the purpose of forest management. Through such groupings, fragmentation of almost 400,000 hectares of private forests has been avoided on the succession of new owners. A reduction in registration fees is allowed when a new owner agrees to accept management of his forest by the Administration.

Moreover, land replanted in conformity with certain standards can benefit from an exemption of land tax for 30 years.

Conversion of Coppice and Coppice with Standards by Changing the Species

Owing to the increased demand for softwoods, conversion to conifer high forest in France has much attraction, especially on private estates where conversion to broadleaved high forest without changing the species has little appeal although this is practiced widely in state and communal forests.

Several techniques are available for doing the work, by hand, mechanically and by the use of chemicals. The extent of the area to be treated and the composition of the crop decides the choice.

Mechanical means. Considerable research into mechanized operations has been carried out which has already yielded useful results. Numerous private planting contractors have mechanical equipment for the destruction of coppice and ground preparation (bulldozers, angledozers, rootrakes, subsoilers, etc.).

Two conditions must be fulfilled before using mechanical equipment:

(*a*) At least 50 hectares must be dealt with at one time, in order to justify the cost of the equipment. That presupposes that large areas are available to be treated, and that the areas are badly derelict so that there is no unnecessary sacrifice of saleable produce from the existing forest or of potentially useful timber.

(*b*) The ground must not be too irregular, and the coppice must not be of species with too vigorous stools: for instance, coppice with a high proportion of hornbeam usually cannot be dealt with by mechanical methods. Conversion generally entails the complete clearance by bulldozer of all stumps and stems in strips 3 meters wide, followed by passing along the center of the strips a subsoiler equipped with two coulters which cut the roots of adjoining stumps. The strips are spaced 5 to 6 meters apart. In the case of very derelict coppice with weak stools, a scrubcutter or heavy rotovator can be used to clear the strips.

[1] N. F. 1.00 = U.S. $4.90.

Chemical methods. Chemical control is becoming increasingly used, especially in the treatment of first-year regrowth of coppice shoots, just before planting conifers; and the chemicals can also be applied to the stumps soon after cutting. Private contractors are equipped for the chemical treatment of large areas with motorized equipment, but chemicals can be used by an owner himself on small areas with small portable equipment.

Manual clearing. Can be used in all types of stand no matter what the area to be treated or the conversion treatment to be applied (complete clearance, strips, group clearance or shelterwoods).

Preparing poor hardwood areas for the introduction of conifers

The methods in use are in proportion to the very wide variety of ecological conditions, component species, and social and economic factors which are to be found in France.

Enrichment. This method is used in worthless or impoverished coppice, or in coppice with standards potentially rich in standards which contain open spaces. In both cases the initial aim is to introduce a limited number of conifers, for example by group planting. From these a fully stocked coniferous stand, more or less mixed with hardwoods, can be obtained at a later stage by natural regeneration. In the latter stages, the operation thus costs less than it does in the beginning. This practice allows considerable areas to be treated, while at the same time preparing for the future. This has been called by an eminent forester, *enrésinement à terme.*

Abies spp., cedars, and maritime and other pines are introduced by planting in:

(*a*) Worthless or devastated coppice cleared by strip or group felling. This coppice originates either from degraded woodland, or from abandoned arable or grazing land on which there has been a natural regrowth.

(*b*) Present coppice with standards selectively felled so as to create gaps where reasonably shade-tolerant species can survive.

Other methods rely on natural regeneration combined with improvement fellings; or, for instance, the planting of poplars in deep moist soils. In each case only between about 300 and 1,200 plants are used per hectare. Special care must be taken in opening up the canopy.

Substitution of species. This can be done in various ways:

(*a*) In strips from 1 to 3 meters wide, with or without retention of a shelterwood. Some cover should be retained over the strips on heavy, wet soils to prevent the water table from rising. The strips can be cleared mechanically where there is only scrub or worthless coppice.

(*b*) By clear felling of more or less large areas ranging from strips of about 20 meters wide to clear felling of more extensive areas, with or without soil preparation. Under these conditions some landowners use large plants of spruce (weeded annually over a period of 5 to 6 years) or pines (which are sometimes sown the year before the coppice is cut).

(*c*) By fairly heavy felling of the shelterwood, retaining from about 200 to more than 1,000 coppice stems per hectare as shelter for the establishment of the conifers. This type of felling is especially practiced in older coppice which still can yield merchantable products, or in the vicinity of urban areas where firewood is collected privately for domestic use. The stems retained for cover increase in girth and value and are then often used for pulpwood. The introduction of *Abies* at lower elevations fits in particularly well with this method which can be, according to the market for hardwoods, one of the most economical because it requires little or no later cleaning (for example, in the Basses-Vosges where *Abies* are planted in coppice under beech standards).

Private woodland owners are often advised, as the first stage in the improvement of their coppice, to allow the coppice to grow on to marketable size before converting to conifers.

Conclusion

The success of the effort to convert poor and degraded hardwood forests can be seen in the growing numbers both of private undertakings specializing in reforestation and of forestry co-operative societies set up for the same purpose. More recently a number of societies, started by government agencies and by local authorities, have begun to take an interest in the problem, for example in the east of France (*Société d'étude des friches et taillis pauvres de l'Est*), in Brittany, in the southwest (*Société de mise en valeur des coteaux de Gascogne*), in the southeast (*Compagnie nationale du Bas-Rhône-Languedoc*), etc. Lastly, private woodland owners are organizing groups, with the encouragement of the Forest Service, for the joint study (at forestry training centers and agricultural training centers) of the problems of converting totally or partially unproductive woodlands. A major exercise in the co-ordination of effort, in the dissemination of technical knowledge, in publicity and in the technical advisory services is taking place, thanks to the joint efforts in their various fields of the private owners, the State and professional foresters themselves.

Treatment of Poor Hardwood Areas for Shelterwood Restocking

J. B. Stocks
Forestry Commission of Great Britain

Until recently the re-establishment of new woodland on poor hardwood sites was almost invariably preceded by clear felling. Poor hardwoods can serve a useful purpose in the establishment of the newly planted crop. This shelterwood system is now being used very largely in the reforestation of derelict hardwood sites of many types.

The types of poor woodland under consideration are those which are unlikely to develop into marketable high forest or coppice. They are generally hardwood or broadleaf crops and can be divided broadly into species which provide a high cover and those which are only capable of producing a low cover.

The most commonly found species in the former or high cover class are *Betula verrucosa* and *B. pubescens*, *Fraxinus excelsior*, *Quercus robur*, *Q. petraea*, *Acer pseudoplatanus*, *Ulmus glabra*, *Tilia platyphyllos* and *Castanea sativa*.

The low cover species are mainly of coppice origin such as *Corylus avellana*, *Quercus*, *Castanea* and *Carpinus betulus* or of shrub-like species among which the most common are *Acer campestre*, *Salix capraea*, *Crataegus monogyna*, *Prunus spinosa*, *Cornus sanguinea*, *Sambucus nigra*, *Ilex aquifolium* and *Ligustrum vulgare*.

Those species which develop the higher cover are capable of growing to tree heights but the lower cover species are in general less than 20 feet (6 meters) in height. Many different species are usually found on the same area except when the previous crop has been worked on a coppice rotation in which case the coppice species predominate.

There is often a great variation in the height and density of the cover crop. Under these circumstances it is advisable, if possible on management grounds, to leave the crop untreated for a few years until the taller, clean-growing species have suppressed much of the lower cover and thus made it easier to penetrate the area with men and tools and to select the desirable shade trees.

Density of canopy to be opened out prior to planting

The taller cover has been found to be more beneficial to the new crop. It is therefore desirable during the selection of the cover crop to retain those trees with a light foliaged crown which is high above the ground; the stems should be sturdy to obviate falling over. It is however desirable to remove initially all trees larger than 8 inches (20 centimeters) diameter at 5 feet (1.5 meters) from the ground and also trees with heavy spreading crowns. Such trees should always be removed before planting takes place as, except by girdling, it is not possible to remove them subsequently without incurring damage to the new crop.

It is also desirable to remove all dense shade-bearing low shrubs, prior to planting, except on the most shallow soils overlying chalk or limestone or where frost is severe. In such cases any form of controlled cover in the early stages of the new crop is beneficial. It is also advisable to tend the cover to form a single canopy rather than to allow the overshade to remain at different levels. The amount of overhead cover to be retained at the time of planting the new crop should not form a complete canopy, especially where it is low. Recent experience of planting under too dense a canopy has proved this by heavy mortality. During the wet summer of 1958 losses were due to the new crop having insufficient light and remaining permanently wet and cold, particularly on the clay soils. Heavy losses during the extremely dry summer of 1959 were also encountered and this was attributed not only to insufficient light but to the excessive removal of soil moisture by the overcrop down to a considerable depth and the consequent complete drying out of the topsoil late in the season. This has been particularly disastrous in cases where an overwood of ash was used in too dense or even a complete canopy.

The amount of canopy to be retained at the time of planting varies with the species, the height of the cover crop and the light intensity of the locality. There is need for more drastic opening up where the light intensity is low, especially in industrial sites with polluted atmosphere. The ideal canopy to be retained would appear to be approximately 60 to 70 percent when the cover is tall but, as the height of the cover decreases so the opening of the canopy should be greater, so that with a low type of such species as hazel coppice (*Corylus avellana*) the cover should provide approximately a 40 to 50 percent canopy.

The species most preferred are *Betula*, *Quercus* and *Ulmus*. These species have the type of crown which permits a certain penetration of light which is favorable to the newly planted crop. Ash (*Fraxinus*) provides a similar type of cover but it removes very large quantities of moisture and nutrients from the soil. *Acer*, *Tilia*, *Castanea* and *Carpinus* cast considerable shade and the large leaves of *Acer* and *Castanea* which provide such an excellent leaf mold free from weeds prior to planting can cover up, at the time of leaf fall, those plants which are too small. If pure, these last species must have the canopy reduced to about 40 percent if the cover is tall, and if the cover is low it should be reduced to no more than 25 to 30 percent. Where mixtures occur, the overcrop should be treated on its merits according to the species present.

New crop species

This system is essentially most suited to the use of the more shade-tolerant trees and those species which would suffer from frost and exposure if planted without cover. It should be emphasized that the use of overhead cover is a means to the establishment of the most desirable species in relation to the permanent site factors and the cover should be manipulated accordingly. The species which have been successfully used are beech (*Fagus sylvatica*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuya plicata*), Lawson cypress (*Chameacyparis lawsoniana*), Douglas fir (*Pseudotsuga menziesii*), Norway spruce (*Picea abies*), grand fir (*Abies grandis*) and occasionally *Abies procera*, *A. veitchii* and *Cryptomeria japonica*. All these species appear to thrive under similar light conditions initially.

These facts are based on the assumption that the choice of species for the site is correct for it is quite clear that the shade-tolerant quality of any species is dependent on all other conditions for growth being suitable and that if a species is planted on an unsuitable soil or with inadequate rainfall or in a polluted atmosphere it is far less tolerant of shade than the same species growing in its ideal environment.

The type of plant to be used is preferably a well-grown transplant of 15 to 18 inches (38 to 46 centimeters). Use of seedlings is, on evidence, quite unjustified. There are also certain weeds such as *Mercurialis perennis* and *Rubus* spp. which grow profusely under denser shade than many trees can ever tolerate and transplants are essential if such dense weed growth is to be overcome.

Rate of opening out of the overwood

The rate at which the removal of the overwood should take place after planting varies according to the species which have been planted and to the weed and new coppice growth which is encountered and particularly to the rate at which the original crop has closed up. Where frosts, especially late spring frosts, are likely to occur, the removal of the shelterwood will be governed accordingly. Thus no hard and fast rules can be given as to the rate of removal of the overstory: one of the major considerations is that it shall be done in such a way that while the new crop never becomes weakened by too much shade the weed growth of the more light-demanding weed species is kept in control.

One of the major advantages of the system is that, while accepting some weed growth, it is possible to prevent undesirable weeds, such as the coarse grasses, from dominating as they would if the area were clear felled. Signs of the planted crop becoming suppressed by excess shade are the small bud formation, loss of color, drooping of the leaves or needles, weak shoots and flattening of the crowns.

The usual procedure for the removal of the overhead cover is for the work to be completed in three operations,

FIGURE 3. – *Silver fir under a cover crop of birch. The birch should now be finally removed or damage from the branches will be caused.*

Courtesy: Forestry Commission of Great Britain

in the first two of which a half of the canopy which remains is removed. The first removal takes place when the new crop is about 3 feet (1 meter) in height which is usually three years after planting. The second removal is when the new crop is 6 to 8 feet (1.8 to 2.5 meters) in height or six years after planting, and the third and final removal takes place when the new crop is 10 to 12 feet (3 to 3.5 meters) in height which is usually nine to ten years after planting. It is however always advisable to remove the cover completely before the new crop has entered its crown, otherwise the branches of the overcrop will cause mechanical damage.

There is no appreciable difference in the rate of removal of the cover for the species which are most commonly used, except earlier removal for Douglas fir and Norway spruce for which the first removal is usually after two years rather than after three years which is safe for the more shade-tolerant species. Where hardwoods are planted it is now the accepted procedure to plant a conifer crop with the hardwood either in alternate lines or three rows of each alternating with the other. Douglas fir and beech have been mixed in this way and where such line mixtures have been planted under cover it is sometimes the practice to thin the cover off the more light-demanding Douglas fir before taking any cover from over the more shade-tolerant beech. This provides overhead light and side shelter, which is very important to the more light-demanding species, and overhead cover and side light to the more shade-tolerant species.

These times at which the removal of the overcrop should take place are general guides only and much will depend upon the rate at which the canopy of the overcrop closes and on the amount of weed growth which appears. The timely removal of the overhead cover is important not only for the reasons already mentioned but it also enables an even crop to be established and prevents the development of large coarse trees in the new crop. The final cutting of the shade trees is often combined with a "wolf thinning" of the new crop.

Financial considerations

Apart from the silvicultural and management advantages of the shelterwood system over complete clearance, the total costs of the two methods are very similar, generally with a slight advantage in favor of the shelterwood system. There is, however, no spectacular monetary saving, as is sometimes claimed, in using overhead cover rather than clear felling. Weeding costs are often much less under the overhead cover system but this may be offset by the extra care which has to be taken later in the removal of the overhead cover to avoid causing damage to the young crop.

In general, very little revenue is obtained from produce derived from the type of cover available. If there is a market then both systems benefit accordingly and if anything the clear-felling system is likely to benefit more due to the difficulty and extra expense of removing any material left as a cover crop. Apart from a very small saving in the number of plants used under cover, the costs to be considered and compared under the two systems are the felling of the overwood and the weeding until the new crop is established.

Of the many examples of costs which have actually been incurred, typical averages where the poor hardwood yields no revenue are as follows:

System	Labor charges, £ per acre[1]
Clear-felling	
Complete clearance and burning lop and top	35
Total weedings during 5 or 6 years	24
TOTAL	*59*
Overhead cover	
Preparation of overhead cover and stacking in drifts	17
Total weedings during 4 or 5 years	9
Removal of overhead cover in 3 stages together with the stacking and final clearing	26
TOTAL	*52*

The costs of cover removal can be reduced considerably in those forests where local markets are available and in such areas the total operation has been carried out at a profit; but such markets are only to be found in a few localities. Nevertheless by a careful study of available markets it is often possible to remove at the initial cutting that material which is then salable and to retain as cover those stems which may develop to become salable during the time they are retained.

The felling and removal of the poor hardwood under either system is the major part of the cost and the only possibility of reducing this is by ring barking. In the extreme southwest of England where there are extensive areas of poor oak coppice it has been possible to do the entire work by a complete ring barking of all stems either at the time of planting or shortly afterward, at a total cost of about £5 per acre (U.S.$34 per hectare). The crowns and stems of the ring-barked trees disintegrate slowly and the total cost of weeding has been £6 per acre (U.S. $40 per hectare).

Since no felling has been done there has been no trouble from coppice regrowth and no expense in stacking unwanted waste wood.

However, in many parts of Britain the need to preserve public amenities totally precludes the methods of ring barking or girdling.

[1] £1 sterling = U.S. $2.80.

Conclusion

1. The *silvicultural* advantages of the shelterwood system as opposed to the system of clear felling are as follows:

(*a*) Many species which are capable of the highest volume production can be more readily established.

(*b*) The forest soil conditions are preserved.

(*c*) The water table does not fluctuate to the same extent. The system is particularly valuable on intractable heavy clays where considerable variations in the water table arise and where bad herbage types tend to dominate.

(*d*) There is a greater survival of those trees which have been recently planted.

(*e*) More protection is provided from frost and wind exposure.

(*f*) Less weed growth is present under cover.

(*g*) The brushwood is more evenly returned, after decomposition, to the soil rather than being burned unevenly over the area. This is because the waste being cut over a period of several years can generally be left to rot whereas by clear felling there is too large a bulk which has in consequence to be burned.

2. The *management* advantages are as follows:

(*a*) There is less weeding which has, of necessity, to be done within a short period during the summer. Such weeding as may be needed can be conducted over a longer season.

(*b*) The removal of the overhead cover can be done at any convenient time and when other work is not available. It is very suitable work for the winter months for there is more shelter for the men and since the leaf is off the cover at this time of year less damage is done to the young crop.

(*c*) Hunting values are enhanced.

(*d*) The transformation of a hardwood scrub crop to a coniferous crop is effected under a system which has higher amenity value than if the whole woodland were clear felled.

Finally, it must be emphasized that in such a system as that described it is quite impractical to explain all the various conditions with which the forester will be faced. Flexibility is therefore essential in the application of the system and, once the broad principles have been explained and understood, the local staff must be given full scope to obtain the best silvicultural, management and financial results possible.

• Chief of the United States Forest Service, **Richard E. McArdle**, in January received from former President Eisenhower the nation's top civilian career service award — the President's Gold Medal Award for distinguished federal civilian service. This is probably the highest accolade ever bestowed by the Government on the young profession of forestry.

Accomplishments cited as the basis for the award were: " His dynamic leadership and vision in the development of the nation's forest resources; his wise and effective action in meeting the rapidly-rising public use of the national forests; building and strengthening working relations of the federal government with state governments and private forest industry; for an increasingly effective forest research program nation-wide; for leadership in world forestry and the conservation of natural resources which has promoted international co-operation and friendship. "

• There has recently been established in Canada a Federal Department of Forestry, which, however, no way infringes on the constitutional rights of the individual provinces to control and administer the publicly owned forests within their borders.

The objectives of the new Department of Forestry are to support, through means appropriate to the Dominion Government, improvement in the management and protection of forest resources, a fuller utilization of forest products, and improvement in the competitive position of Canadian forest industries.

J. D. B. Harrison has been appointed as Deputy Minister. After successive positions of increasing responsibility in Canadian forestry, he was appointed to the Forestry and Forest Products Division of FAO in 1946, serving for 4½ years in Washington, D. C. In 1951 he returned to Canada to become Chief of the Forest Research Division. In 1956 he was appointed Director of the Forestry Branch.

The International Union of Forest Research Organizations

J. MacDonald
President, IUFRO

The combination of letters, IUFRO, by which the International Union of Forest Research Organizations is now generally known, is, doubtless, familiar to most readers of *Unasylva* but many may not be aware of the Union's interesting history, which goes back now for 70 years, nor of its attempts to maintain effective international co-operation in its own field over that lengthy period of time.

The Union was initiated in 1890. In that year, an International Congress for Agriculture and Forestry was held at Vienna and during the proceedings one of its sections proposed the formation of an international association of forest research stations. A committee was set up to examine the proposal, a committee composed of Boppe from Nancy, Bühler from Zurich, Danckelmann from Eberswalde, and Friedrich from Mariabrunn. This strong committee was reinforced, a little later, by the addition of Schuberg from Baden.

Shortly after 1870, an association of forest experimental stations in the various states of the German Empire had been founded and this association held meetings, usually annually, at which common problems were discussed. In 1891, the German association invited to its meeting at Badenweiler in the Black Forest the committee which had been appointed the previous year at Vienna to consider the establishment of an international body and, as a result of the joint discussions, agreement was reached on the general outlines of the new organization and on the proposals which should be made to the various governments concerned. Although, therefore, the foundation of the Union can be regarded as dating from this meeting in 1891 in Badenweiler, the Union did not emerge as an independent body till the following year.

In 1893, the Union held its first meeting at Mariabrunn. It was a small affair, the only members being the Swiss, Austrian and German research institutes, but delegates from France, Hungary and Italy were also present, presumably in the capacity of observers. The second meeting was held at Brunswick in 1896 when 16 delegates were present, including one from Russia and one from Sweden, while the third assembly took place at Zurich in 1900. For its fourth meeting in 1903, the Union went back to Mariabrunn. This meeting was one of some consequence, for during the sessions, the delegates worked out a form of constitution and agreed formally on the name, which has been used ever since — *Internationaler Verband forstlicher Forschungsanstalten*. The fifth assembly of the Union took place at Stuttgart in 1906 when there were 33 delegates from Austria, Belgium, Bulgaria, Denmark, France, Germany, Hungary, Russia, Switzerland and the United States of America, while the sixth meeting was held in 1910 at Brussels, the first time that the Union had moved out of the German-speaking countries. The attendance at this meeting in Belgium was proof of wider interest in the Union's work and activities, for 18 countries were in all represented including newcomers such as Canada, the Netherlands, Japan, Portugal, Romania, Serbia, Spain and the United Kingdom.

It was agreed in Brussels that the seventh congress of the Union should be held in Hungary in 1914 but that never happened, for the war of 1914-18 broke out about a month before the congress was due to open and it was to be a long time before the next gathering took place. The 1910 meeting in Brussels, therefore, marked the end of the first stage in the Union's development, a stage which saw its gradual evolution from an association composed of members drawn exclusively from the German-speaking countries, into a body which, though still small, had become truly international.

Early subjects for discussion

It is interesting to look back on some of the subjects which were discussed at those early meetings. Thinning and thinning experiments were much in evidence from the very first meeting, when Lorey advocated the inclusion of a crown thinning treatment in every set of comparative plots. Provenance of seed was also in the forefront of the discussions which led, in 1907, to the first international scheme for comparing the growth of Scots pine drawn from a wide range of origins in Europe, undertaken by Austria, Belgium, Germany, Hungary and Sweden. Among other subjects noted in the records are the effect of forests on the water table, the measurement of rainfall which runs down the stems of trees, yield tables, site descriptions, manuring in forestry and the factors to be measured in tree growth. Forest bibliography caused the Union some concern in the old days, for, although the number of

articles, papers and books on forestry was then small in comparison with what it is today, our predecessors were nevertheless aware of the need for classifying forest literature and making it available to research workers. In the end, this problem was to prove too great for the Union, the slender resources of which were insufficient to solve it.

The 1914-18 war brutally interrupted the work which the Union had been pursuing in the field of co-operative forest research and so disastrous was its effect on this small organization that it was not possible for members to resume relationship with each other in the old way. It was not until 1926, on the occasion of the First World Forestry Congress, that research workers from Europe and North America decided that the Union ought to be revived, and this was effected three years later when the reconstituted Union met at the Stockholm Congress under the presidency of Professor Hesselman.

Reorganization of the Union

At this congress, the organization of the Union was completely revised, the most important change being the appointment of a Secretary-General responsible for most of the administration. This provided the Union with something which it had lacked in its early days. For a considerable number of years this office was held by the distinguished Swedish forester, Professor Sven Petrini, to whose paper, "International co-operation in forestry," published in 1938 in *Svenska Skogsvardsföreningens*, I am indebted for much information on the early history of the Union. Under the new regime, the Union began to expand once more and to undertake new ventures in the field of international co-operation. The eighth congress was held in 1932 at Nancy and the ninth in Hungary in 1936. It was agreed to hold the tenth congress in 1940 in Finland but this congress, like that planned for 1914, did not take place and for the same reason, the outbreak of war.

Bibliography and forest tree seed exchange

In the all-too-brief period between 1929 and 1940, the Union in its second phase was engaged in certain major projects. The first of these was an attempt to deal with the difficult and long outstanding problem of bibliography, the main objects of which were to provide an information service covering all current writings on forestry and to classify the older literature. The attempt to deal with current publications was continued for a number of years but, in the end, unfortunately failed. This is not surprising when the complexities of the problem are considered in the light of the slender resources which the Union was able to command but there is no doubt that much was learned in the course of this bold experiment.

Other work in the field of bibliography was more successful. A system of classification, with which the name of Flury is associated, was elaborated, and this marked a very great step forward, although Flury's system has now been superseded by that from Oxford, with which the Union also has been associated. The proposal that each country should prepare a bibliography of its own forest literature met with only partial success as the admirable bibliographies produced by Denmark and by Hungary were not followed by similar works from other countries. Indeed, it is only within the last two years that a third national bibliography has appeared on the scene — the *Bibliografia Forestiera Romina* — produced in 1958 by the Forest Research Institute in Bucharest, one of the member institutes of the Union.

During this period the Union organized the exchange of forest tree seed of known provenance and arranged for the conduct internationally of provenance trials of Norway spruce and Scots pine. Work was carried out on the standardization of site descriptions in forest research and a brief code of sample plot procedure was worked out and published.

Postwar developments - relationship with FAO

The second world war lasted longer than the first but in 1939 the Union was a much stronger body than it had been in 1914, and it was able to meet again at its tenth congress at Zurich in 1948 under its President, Lonnröth. But a new development had occurred immediately after the war ended. The Food and Agriculture Organization of the United Nations was given a Division of Forestry and there was strong pressure on the Union to give up its identity and merge with the Forestry Division of FAO. This was strongly resisted by the Union. The negotiations conducted by Lonnröth and by his successor Burger led to an agreement between the Union and FAO by which FAO assumed the Secretariat of the Union and undertook to help the Union in various ways, while the Union agreed to have an observer from FAO at its committee and other meetings. The arrangement whereby the Secretariat resided with FAO at Rome, while the President was elsewhere, was not an easy one to operate and that it worked as well as it did was due largely to the skill of FAO's representative, I.T. Haig, who rendered great service to the Union, and indeed to forest research the world over during those difficult postwar years.

At the same time the Union reorganized its scientific work by dividing it into sections each under an eminent forest scientist as section leader. The work of the sections comes under review periodically when congresses are held but between these meetings the sections enjoy a considerable amount of freedom in action. This is as it should be in a voluntary organization. It is perhaps not generally known that the section leaders undertake a very large amount of work and this is all done voluntarily and without payment.

At present, the following are the sections and section leaders:

Section 01 Forest bibliography
Prof. E. Saari, Helsinki (Joint FAO/IUFRO Committee)

Section 11	General forest influences Dr. H. G. Wilm, Albany, New York
Section 21	Research on site factors Prof. A. de Philippis, Florence
Section 22	Study of forest plants Dr. C. Syrach Larsen, Horsholm, Denmark
Section 23	Silviculture Prof. H. Leibundgut, Zurich
Section 24	Forest protection Prof. A. Biraghi, Florence
Section 25	Growth and yield. Forest management Prof. Fehim Firat, Istanbul
Section 31	Forest economics Prof. J. Speer, Munich
Section 32	Operational efficiency Prof. U. Sundberg, Stockholm
Section 41	Mechanical conversion Prof. J. Campredon, Paris.

The Union held its eleventh congress at Rome in 1953 and its twelfth in 1956 at Oxford. Both congresses were largely attended and attracted wide attention.

Reference has been made to the agreement with FAO which was signed on 1 January 1949, but changes have recently taken place in the relations between the two bodies. In 1957, FAO asked to be relieved of the obligation to provide a secretariat for the Union and to this the Union agreed; a year later the Union was given specialized consultative status by FAO. Relations have been most cordial during recent years and have undoubtedly become closer. FAO, by means of various grants of money, has made it possible for the Union to carry out, through its members, several useful pieces of research while the Union, on its side, is prepared to give what help it can in research matters to the larger organization in Rome, either by undertaking specific tasks or by making available, by means of its publications, information and guidance on research matters.

The affairs of the Union are administered by the President, Vice-President (H. Van Vloten) and its permanent committee which meets annually, each year in a different country, and which is responsible to the International Council, the ruling body in the Union, but, as this only meets when a Congress is in session, the Permanent Committee is given considerable powers in order to carry on the business effectively. This committee is representative of forest research the world over and, at the present time, it consists of the following members: T. Bunusevac (Yugoslavia), C. Carbonnier (Sweden), R. N. Datta (India), V. L. Harper (United States of America), A. Horky (Austria), C. F. Korstian (United States of America), M. Kreutzinger (Poland), J. Lebrun (*Institut national pour l'étude agronomique du Congo* [INEAC]), M. Ohmasa (Japan), A. Oudin (France), A. Uzcategui (Venezuela). A. Métro acts as Observer from FAO.

The Union, with a membership of nearly 140 research stations and university departments, is now looking forward to its thirteenth congress which will be held at Vienna in September 1961. An attractive program is being prepared and the discussions will range over a wide variety of topics. The congress, which will last for one week, will be preceded or followed by tours in different parts of Austria.

CORRECTION

In *Unasylva*, Volume 14, Number 4, a printing error occurred on page 198 in the item *Oxford System of Decimal Classification*. Under At 17 (*a*) and (*b*), double hyphens (--) should be substituted for dashes (—).

The Work of FAO

African Forestry Commission

Two new Regional Forestry Commissions — the African Forestry Commission and the North-American Forestry Commission — were established by the last Conference of FAO to complete the pattern so as to cover all the Member Nations of the Organization. The North-American Forestry Commission will meet for the first time in Mexico City in mid-1961. The African Forestry Commission held its first session at the Federal Department of Forest Research in Ibadan, from 31 October to 7 November 1960, at the kind invitation of the Government of Nigeria.

Over 40 delegates from 22 countries participated as follows: Cameroun, Central African Republic, Chad, Dahomey, France, Gabun, Ghana, Guinea, Ivory Coast, Liberia, Mali, Morocco, Nigeria, Portugal (Angola, Mozambique), Rhodesia and Nyasaland, Senegal, Sudan, Togo, Union of South Africa, United Kingdom (Sierra Leone, Southern Cameroon, Tanganyika, Uganda), Upper Volta, and the United States of America. The Commission for Technical Co-operation in Africa South of the Sahara (CCTA) and the International Labour Organisation (ILO) were also represented. Sir Henry Beresford-Peirse, Deputy Director of the Forestry and Forest Products Division, represented the Director-General of FAO.

His Excellency the Governor of Western Nigeria, Sir Adesoji Aderemi, delivered an address of welcome and stressed the fact that this was the first international meeting to be held in Nigeria since the country became independent. It was very appropriate, he said, that the first session of the African Forestry Commission should take place in Western Nigeria, because the forest was one of the mainstays of its economy. Forest exploitation, in point of fact, had become one of the major industries of Western Nigeria, and timber represented its fourth most valuable export.

The session was formally opened by Federal Minister Alhaji Shehu Shagari, who also underlined the happy coincidence that the first session of the Commission was the first international meeting to be held in independent Nigeria. If it were true, added the Federal Minister, that social and economic development in Africa has often been hindered by the forest, it was just as true that forest destruction was now proceeding at an alarming pace and widespread soil erosion was its natural but most harmful consequence.

The Commission elected Mr. Olu Akpata, Chief Conservator of Forests of Western Nigeria, as its Chairman until the beginning of its second session. Messrs. Robert G. Sangster (Chief Conservator of Forests of Tanganyika), François Eko-Ebongué (*Directeur des eaux et forêts* of Cameroun) and Houssa Touré (*Inspecteur national des eaux et forêts* of Guinea), were elected Vice-Chairmen for the same term of office. Two Rapporteurs were appointed in the persons of Mr. Ronald W. J. Keay, Director of the Federal Department of Forest Research (Nigeria), and Mr. Louis Bégué, *Inspecteur général des eaux et forêts* of the *Service de coopération technique d'Outre-Mer* (France). The FAO regional forestry officer, G. G. Watterson, served as Secretary.

Policy issues

With the accession of countries to independence, national forest policies are liable to reorientation. The first function of the Commission appeared to be to assist and advise those governments in the elaboration of forest policies calculated to further the welfare of the community, suited to national and local conditions, and satisfying both immediate and long-term needs. It was the general consensus that:

(*a*) Systematic forestry can only be satisfactorily practiced in areas specifically and permanently set aside for the purpose. The location, extent and nature of these areas are dependent upon the two basic considerations of the forest's protective and productive roles.

(*b*) Where the retention or extension of forest cover is necessary for the maintenance of land stability and climatic conditions, and for the regulation of water supplies, this is an overriding consideration.

(*c*) As to the productive role of the forest, the satisfaction of present and future local and national requirements, and provision for export of timber and other produce derived from forest and tree cover on a sustained yield basis, must largely determine the distribution and size of such areas.

(*d*) On land outside such areas, the role of trees in providing additional sources of fodder, fruit, fuel and other produce of value to the agricultural and pastoral communities, should be maintained and encouraged.

The following were the Commission's main conclusions:

(*a*) There is need to know what forest resources exist and the requirements they must meet.

(*b*) A sufficient and properly trained forestry staff, provided with financial and other means, is essential to manage such resources.

(*c*) An understanding and co-operative public opinion is indispensable to the forester.

(*d*) Comprehensive and systematic research is basic to sustained progress in forestry.

FIGURE 1. – *A map of Africa showing the countries which are Members and Associate Members of FAO.*

The shortage of trained staff at all levels was one of the more serious obstacles to development of forestry in Africa, and concern was felt about the inadequacy of educational and training facilities within the region.

Problems of the savanna

Greater attention should be given to fast-growing indigenous species whose possible contribution had so far been neglected. In this connection, the Commission requested that preliminary information on experience with fast-growing indigenous species, their silviculture and especially their utilization, be collected and published by FAO.

There was urgent need also for further work on exotic species (other than those already introduced) which might be suited to the savanna and arid areas of the African region.

In view of the wide impact that a better utilization of the savanna may have on the economic development of many countries of the region, it was decided to set up an *ad hoc* working party to study the problem and

report to the next session of the Commission. The terms of reference were:

1. To enquire into, and determine as far as possible, the requirements for the successful establishment of plantations within the savanna areas of the region by:

(*a*) examination of the work already carried out in order to

(*i*) determine the methods which have met with success, and to identify the main difficulties which have been encountered,

(*ii*) suggest possible methods for the assessment, before planting, of suitable sites (e.g., by the use of indicator species, soil surveys, water table surveys, etc.);

(*b*) examination of such species trials as have already been carried out, in order to give guidance for the choice of species.

2. To recommend with some precision the lines of research likely to yield information which will enable the difficulties to be overcome.

3. To suggest, by examination of species used or occurring in areas of other regions having similar climatic factors to the savanna areas of Africa, possible species for trial in this region.

Wildlife management

Of all the regions of the world, Africa is unique in the wealth of its wildlife. In stressing that it was one of the great natural resources of the continent, the Commission pointed out that, like other renewable resources, wildlife could be wasted through lack of proper management. The situation was in fact already critical in some places and, unless steps were taken quickly, there was a real risk that it would be impossible to put matters right.

Wildlife was threatened by:

(*a*) illegal hunting;

(*b*) inadequate game laws, or laws impossible to enforce due to inadequacy of funds;

(*c*) introduction of unsuitable domestic animals in certain areas to the exclusion of native fauna, which might be managed more profitably.

The problem areas were broadly subdivided into:

(*a*) those which rapidly deteriorated under artificial systems of land usage;

(*b*) those marginal to any form of artificial use, where indigenous fauna affords the only known possibility for economic revenue;

(*c*) those (such as the tse-tse belts) in which disease makes domestic livestock production difficult and costly, and protein deficiency in human nutrition is consequently acute.

The Commission stressed the need for:

(*a*) A clear and constructive declaration of policy by each country in regard to its wealth of wildlife, and on the recognition of this as a part of the African culture and as a factor of the economic expansion of the region, wholly consistent with the upsurge of national growth in the African continent.

(*b*) A clear designation of areas where the conservation of wild animals is to be recognized as a socio-economic activity; and, within such areas, the creation of reserves to serve as breeding sanctuaries, accessible to the public during certain times of the year to promote awareness and understanding of the value of such a resource.

(*c*) Inventories, surveys on the economics of wildlife management, and research into the biology and behavior of wild animals. It was pointed out that such work could best be done on a national basis because of the great variation of local conditions and with a view to promoting local interest, but that it should be co-ordinated at the regional or subregional level.

(*d*) Country extension programs aimed at obtaining the understanding and co-operation of the local communities, primarily through their active participation in the benefits derived from wildlife.

(*e*) Facilities to be created, at existing universities in Africa south of the Sahara, for higher-level education in wildlife management.

The Commission accordingly decided to set up an *ad hoc* working party to report to the next session with terms of reference as follows:

1. To examine the wildlife policies which Member Nations intend to put into operation.

2. To determine what common factors exist between these policies.

3. To summarize the major points of divergence in the wildlife policies of Member Nations.

4. To examine the London and Bukavu conventions and determine how far they fall short of the policies of Member Nations.

5. To prepare before the Conference of the Joint Commission for Technical Co-operation in Africa South of the Sahara (CCTA) and the International Union for the Conservation of Nature (IUCN) Conference in Tanganyika, September 1961, a report for circulation to Member Nations embodying in separate sections:

(*a*) points of policy which are common to the majority of Member Nations;

(*b*) points of policy on which there is a measure of agreement between groups of Member Nations;

(*c*) points of policy which are peculiar to single Member Nations.

6. Having received the comments of Member Nations, to prepare — in consultation with CCTA, IUCN, UNESCO and other interested institutions — a draft *African convention for the conservation of wildlife through controlled use*, for circulation to Member Nations and consideration at the second session of the African Forestry Commission.

Regional study of wood resources and requirements

The net imports of wood products by value have doubled over the past several years, and countries of the African region will have to decide either to increase domestic production of forest products, to endure shortages which might slow down their development, or pay ever-increasing import bills. The Commission was informed that a project had been included in the current program of work of the United Nations Economic Commission for Africa, for a survey, jointly with FAO, of the forestry sector of the economy of the African region.

There were many difficult problems in carrying out such a survey: detailed inventory data were available for but a fraction of the region's forests; statistics of forest products consumption and trade were far from complete, and such data as were available covered but a short time span; very little was known about the scale and pattern of wood consumption. It was, nevertheless, considered possible — given the close support and collaboration of the Forest Services and other Government Departments concerned — to establish, for the first time, orders of magnitude for the principal trends of timber requirements and supply possibilities, to draw attention to the principal problems requiring solution in the different areas of Africa, to indicate the kind of data needed for the solution of these problems, and — in certain cases — to point to suitable lines of action and suggest priorities.

The Commission believed that the results of a study of this nature would be of value to all concerned with the formulation of forest policy and plans for forest industries. It was, however, stressed that the regional study should not be regarded as a substitute for, but should rather stimulate the undertaking of national studies on timber resources and requirements. The Commission concurred in principle with a suggestion made by the Secretariat for a simple survey of wood consumption to provide the data necessary for the African timber trends study. It was hoped that the study would be ready for submission to the Commission's next session to be held in 1962, probably in a country of East Africa.

Latin-American Conifers

Twenty-one countries, concerned with introducing or improving plantations of conifers originating from Mexico and Central America sent 26 participants to a seminar and study tour organized by FAO at the request of the Latin-American Forestry Commission, with the generous co-operation of the Government of Mexico.

Assembling in Mexico City on 20 September 1960, the group had a brief introductory session at the *Instituto Nacional de Investigaciones Forestales*. During the next four weeks, the party toured exhaustively, in more senses of the word than one, the whole length and most

FIGURE 2. – *Trucks loaded with logs from the Sierra de Juarez forests on their way down to the government-built paper mill at Tuxtepec, Mexico. From an altitude of some 10,000 feet these trucks must travel along a winding road down to the mill, located at an altitude of 1,300 feet (400 m.) above sea level. Construction of timber roads and adoption of equipment suitable for the haul involved are but two of the many phases of the Government's forestry development program in which experts from FAO are lending technical assistance.*

Courtesy: United Nations

of the breadth of the Republic of Mexico and on their return to Mexico City spent another week from 21 to 28 October in technical discussions. More than half of the group then continued to British Honduras for five days and to Cuba for another five days to see how the coniferous species of those countries are managed.

The primary objectives of the seminar and study tour were the observation, discussion, and exchange of knowledge and experience as to the value of the many species encountered, their possibilities for introduction in various soils and climates of the interested countries, the improvement of their productivity and quality, co-operative arrangements for the procurement of authentic seed and exchange of planting materials, the results of research, and the co-ordination of future research.

The participants not only presented statements on the experience with the various species within their own countries, but also discussed and summarized the information gleaned during the tour. The following recommendations were made:

1. Areas of untouched natural forest should be set aside in the main forest regions and preserved against external influences in order that biological research can be carried out in undisturbed conditions.

2. The very important results of planting Latin-American coniferous species in various countries, particularly in Africa, should be the basis for a future study tour in those areas.

3. Future work with Latin-American conifers should be followed on a continuing basis by appropriate action under the leadership of FAO.

4. High priority should be given to organizing the procurement of authentic seed supplies.

The co-directors for the seminar and study tour were R. A. Villaseñor for the Government of Mexico and A. Y. Goor for FAO. As stated by Dr. Goor at the close of the seminar: " A large measure of the success of this seminar and study tour is due to the tremendous amount of co-operation, technical assistance, and generous hospitality we received wherever we went, for which we are greatly indebted to the managements and personnel of the many forest industries and units visited. Without their assistance, our task would have been impossible. For allowing us to make such a comprehensive visit and for undertaking the vast amount of preparation and organization we wish to record our sincere gratitude to the Government of Mexico and particularly to Professor Enrique Beltran, its Under-Secretary for Forests and Wildlife Resources, and to the staff of the *Instituto Nacional de Investigaciones Forestales.*"

A report of the seminar and study tour embodying the summaries of information and recommendations for further work is available on request.

Torrent Control and Protection from Avalanches

(European Forestry Commission)

A fifth session of the Working Party on Torrent Control and Protection from Avalanches, sponsored by the Spanish Government, took place from 3 to 12 October 1960 and consisted, as is usual, of a study tour interspersed with business meetings.

The tour, well organized by the Spanish Forest Service headed by Navarro Garnica, Assistant Director of State Forests, and the Chiefs of the Hydrology and Forestry Divisions of Saragossa and Barcelona, Messrs. de Ayerbe Valles and Coll Ortega, covered mainly the Pyrenees valleys near Jaca, and Pobla de Segura. It was particularly interesting because it enabled the participants to visit plantations, some established and others still in process of formation, combined with some highly ingenious engineering structures for torrent and avalanche control worked out by the Spanish Forest Service. Begun as far back as 1912 to protect the frontier railway station of Canfranc, the project particularly attracted the attention of the members of the Working Party who recommended that a research program be developed in these valleys for technicians from all countries interested in problems connected with snow and avalanches. (*See* also *Unasylva*, Volume 9, Number 3.)

During the technical meetings, many topics were considered by the Working Party. It decided that in future member countries would be requested to send in regular progress reports on research into the most economical methods of torrent and avalanche control, whether in the form of special engineering structure, the use of new materials, new methods of calculation of dimensions, or improved organization of work camps, etc. It would become a regular practice of the Working Party to analyze and discuss these reports at its sessions.

Progress was reported in compiling terminologies on subjects with which the Working Party is concerned and arrangements were made for having these terminologies put into final form. The difficult and vital question of classification of torrent basins for the purpose of making sound assessments of how much it would cost to bring them under control, and whether the efforts required would be justified, was introduced in an excellent paper by the Rapporteur, M. P. Maragaropoulos (Greece). His studies on this subject will be continued.

Finally, in compliance with the wishes of the European Forestry Commission, the Working Party proposed a widening of its terms of reference, reflected in a change of name to *Groupe de travail de la correction des torrents, de la lutte contre les avalanches et de l'aménagement des bassins-versants* (Working Party on Torrent Control, Protection from Avalanches and Watershed Management). The desirability was stressed of close co-operation with agricultural economists and farming

experts interested in problems of high mountain areas.

Thirty representatives from 10 countries attended the session, which was presided over by J. Messines (France), with A. Weber (Austria) acting as Vice-Chairman. The International Union of Forest Research Organizations (IUFRO) sent an observer, as did also the World Meteorological Organization (WMO), to whose close collaboration the Working Party attaches great value.

Chemical Conversion of Wood

Wood saccharification has been used in several countries during national emergencies in order to produce yeast and alcohol, but except in the U.S.S.R. there are no full-scale commercial plants in operation today. A significant development is, however, taking place in Japan where a wood sugar plant that will use 70 tons of wood per day is now under construction. Several other projects for mills with wood intakes of about 100 tons per day are in preparation. The mills will be equipped to produce crystallized dextrose and xylose sugars of high purity.

These developments form part of a program to promote sugar production in Japan, from sugar beets and corn as well as from wood, in order to reduce the heavy dependency on imported sugar. They will also serve to provide outlets for wood residues as well as small-sized timber and will give opportunities for the better management of hardwood forests, for instance on Hokkaido.

Such was the background of the second meeting of the FAO Working Party on WoodH ydrolysis which was held in Tokyo, 10 to 15 October 1960, at the invitation of the Japanese Government and under the sponsorship of the Japanese wood and chemical processing industries. There were 43 participants from six countries.

Information submitted to the meeting brought to light much hitherto unpublished work and demonstrated the great Japanese efforts made in this field. It was possible to assemble comparative data on no less than four different wood hydrolysis processes.

The prime purpose of the new industry is the production of dextrose sugar, i.e., wood saccharification. However, the utilization of the other sugars, primarily xylose as well as of the lignin residue, attracted much attention. With the fuller use of the wood components which is planned in connection with several of the new projects, the term chemical conversion of wood more accurately describes the new industry than wood saccharification. In view of the rapid development of the wood hydrolysis industry that is expected to take place in Japan the meeting recommended that the FAO Technical Panel on Wood Chemistry should plan a further meeting to review the progress made over the next few years.

FAO Technical Assistance Reports on Forestry and Forest Products

These reports are in the main confidential documents and are not usually available for general distribution. As they appear, they are noted in Forestry Abstracts, *published quarterly by the Commonwealth Forestry Bureau, Oxford.*

Africa

Ethiopia

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321	Forest Policy and Forest Development - 1954	E. H. F. Swain
—	The FAO Forestry Mission - 1956	H. Vernède
675	La forêt et le développement économique - 1957	H. Vernède
1143	Forestry Development - 1959	W. C. Bosshard

Ghana

863	Prospects of Development of the Forest Industry - 1958	M. N. Gallant

Liberia

952	The Timber Production Potential of Liberia - 1958	M. N. Gallant

Northern Rhodesia

274	Preliminary Pulp and Paper Survey - 1954	B. Steenberg

Tunisia

803	Création d'une station de recherches forestières - 1958	A. Métro

Asia and Pacific

Afghanistan

734	Forestry Development - 1958	B. Clarke

Burma

16	Integration of Forests and Industries - 1952	J. A. von Monroy
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456	Part I: Division of Forest Research - 1956	M. Näslund
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614	Mechanization of Teak Extraction - 1957	K. A. Miedler
692	The Teakwood Trade - 1958	M. N. Gallant
—	Wood Anatomy and Biology-1960	P. J. H. Gottwald

Ceylon

41	Mechanical Logging - 1952	A. C. Decamps
—	Wood-working Machinery and Saw Doctoring - 1954	J. McVeigh
377	Reforestation - 1955	C. Letourneux
513	Mechanical Logging - 1956	A. C. Decamps
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India

60	Wood Technology - 1952	F. F. P. Kollmann
141	High Mountain Timber Extraction - 1953	A. Huber
145	Sawmilling in the Andaman Islands - 1953	V. Hasek
155	Plywood Industry - 1953	O. Kraemer
268	Preliminary Pulp and Paper Survey - 1954	A. Sundelin
367	Saw Doctoring in the Andaman Islands - 1955	B. E. Fredriksson
378	Control of the Arid Zone of Rajasthan - 1955	A. Y. Goor
490	Efficiency Promotion and Research - 1956	A. Koroleff
630	Development of Forest Industries in the State of Assam - 1957	L. Vinton Burns
—	Training of Forest Workers in Northern India - 1957	H. G. Winkelmann
680	Soil Conservation - 1957	R. M. Gorrie
716	The Plywood Industry - 1957	R. Cabell
795	The Protection of Wood against Marine Borers - 1958	G. Becker
890	Resin Tapping - 1958	J. D. Strange
1087	The Logging Training Center at Batote - 1959	H.G. Winkelmann
1106	Bamboo Preservation and Soft Rot - 1959	W. Liese
1229	The Sandal Spike Disease - 1960	H. R. Kristensen
1236	Watershed Management Research in India - 1960	B. Frank
1237	Saw Doctoring in the Andaman Islands - 1960	B. Fredriksson

Indonesia

294	Preliminary Pulp and Paper Survey - 1954	J. A. von Monroy and R. Maronne
309	Logging - 1954	F. Cermak
546	Forest Industry Development Program - 1956	J. A. von Monroy
671	Development Program for the Match, Veneer and Plywood Industry - 1957	K. Fraedrich
1020	Pulpwood Logging - 1959	A. Koroleff
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209	Forestry - 1954	E. Robbe

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—	Timber Extraction in East Pakistan - 1951	A. Rule
—	A Study of the Medicinal Plants of West Pakistan - 1952	G. M. Hocking
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65	Sawmilling - 1953	F. Cermak
275	Preliminary Pulp and Paper Survey - 1954	J. A. von Monroy and A. Sundelin
564	Desert Areas of West Pakistan - 1957	D. M. Currie
—	Wood Research Division at the Pakistan Forest Research Institute - 1957	A. A. Dosoudil

Philippines

382	The Development of the Pulp and Paper Industry - 1955 Annexes 1-6	UNTAA/FAO
470	Forest Policy and Legislation - 1956	H. G. Keith

Sarawak

1189	Export of Ramin - 1960	M. N. Gallant

Thailand

37	Sawmilling - 1952	K. McAlister
47	Reforestation - 1952	C. Letourneux
479	Sawmill Modernization - 1956	M. A. F. Dijkmans
532	Silvicultural Research - 1956	J. Prasad
545	Inventory Methods for Tropical Forests - 1956	F. Loetsch
895	Forest Inventory of the Northern Teak Bearing Provinces - 1958	F. Loetsch
—	Timber Seasoning and Preservation Research - 1958	K. A. Miedler

Viet-Nam

539	Les perspectives du développement au Viet-Nam - 1956	UNTAA/FAO
751	La possibilité de produire des panneaux de construction avec des déchets organiques et plus particulièrement sur la construction d'habitations populaires - 1958	W. Rosa de Pauli
897	Possibilité de développement d'une Industrie de papier du pays - 1959	W. Piesslinger-Schweiger

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—	Australia Study Tour on Eucalypts - 1952	FAO
—	Timber Grading School - 1952	C. O. Flemmich
183	Mechanical Logging Training Center - 1953	H. G. Keith
504	Forest Research Workers' Seminar - 1956	J. G. Osborne
703	Development Center on Watershed Management - 1957	C. Holscher

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—	An Austrian Investment Program for Forestry and Forest Industries - 1950	D. R. Cameron and E. Glesinger
—	Forestry Fund - 1952	J. A. de Vaissière
—	Sawmilling in Austria - 1952	A. Simonsson
—	Application of Aerial Photography to Austrian Forest Inventory - 1953	D. A. Boon
142	Das Oesterreichische Forschungsinstitut für Forstprodukte - 1953	G. M. Hunt
143	Die Forstliche Bundesversuchsanstalt für die Waldstandsaufnahme - 1953	M. Näslund
218	Investment Program for Forestry and Forest Industries - 1953	E. Glesinger
307	Reforestation - 1954	Raiford F. Brown

Greece

—	Preliminary Pulp and Paper Survey - 1953	R. von Dückelmann and A. Sundelin

Iceland

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Israel

131	Forest Policy - 1953	D. R. Cameron
586	Shelterbelts and Windbreaks - 1957	W. Naegeli

Malta

551	Afforestation of Waste Lands and the Development of Tree Planting on Agricultural Lands - 1956	H. G. Keith

Turkey

—	Logging Techniques and Training - 1957	P. J. P. Nipkow
932	Reforestation - 1958	L. W. Isaac
1153	Logging and Forest Road Construction - 1959	E. Wettstein
1233	Logging and Forest Road Construction - 1960	P. Nipkow

Yugoslavia

54	Fast Growing Tree Species - - 1953	J. Pourtet
57	L'industrie des contreplaqués - 1953	J. S. Bethel
59	L'utilisation des déchets du bois - 1953	F. Bender
—	Seed and Genetics - 1953	C. Syrach Larsen
62	La conservation des sols - 1952	A. Dugelay
70	La création d'un Institut du bois à Zagreb - 1953	C. W. Scott
96	Le déroulage et le tranchage du bois - 1953	J. Venet
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201	La politique forestière - 1953	J. A. de Vaissière
224	Die Methoden zur Verbesserung des Zuwachses und der Produktion der Wälder Jugoslaviens - 1954	H. Leibundgut
240	Die Rationalisierung der Holzexploitation in Gebirgsgebieten - 1954	A. Huber
312	Les scieries à rubans - 1954	V. Degraeve
341	Kiln Drying - 1954	E. J. Sahlman
351	Les problèmes de reboisement - 1954	J. L. Prax
492	Réunion d'experts forestiers sur les problèmes d'assistance technique - 1956	FAO
599	The Prevention of Erosion and Torrent Action - 1957	G. Naegeli
657	L'aménagement des bassins de réception et le contrôle de l'érosion des sols - 1957	W. E. Bullard P. de Luca and J. Messines
774	Die Rationalisierung des Holztransportes und die Forstaufschliessung in Gebirgsgebieten - 1958	E. Hafner
811	Forest Inventory Methods - 1958	B. Simonsson
848	Waldbauseminar in Jugoslawien über Femelschlagbetrieb - 1958	H. Leibundgut

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379	Séminaire de politique forestière - 1955	FAO
859	Silviculture of Pure and Mixed Forests, Study Tour in Czechoslovakia - 1958	M. A. Hüberman

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Iran

44	La carbonisation - 1952	E. E. F. Uhart
140	La politique et la législation en matière forestière - 1953	E. E. F. Uhart
199	Wood Technology - 1953	W. Varossieu
290	Forest Range Management - 1954	V. P. Carocci Busi
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520	Les études écologiques sur la flore ligneuse de la région caspienne - 1956	R. Rol
—	Forest Policy - 1955	Sir Herbert Howard
541	L'établissement d'un Centre de recherches forestières - 1957	E. Allegri
561	L'organisation de la recherche forestière - 1957	R. Morandini
579	Le problème du pâturage en forêt - 1957	J. Rolley
790	Les directives à suivre en matière de politique forestière - 1958	F. Genty
—	La méthode d'aménagement expéditive des forêts du nord de l'Iran et annexe - 1959	V. Tregubov
1176	Development of Forestry, Forest Utilization and Forest Industries, and the Demonstration Forest Training Center, Lowe - 1959	H. A. M. Gläser
1297	Politique de développement forestier - 1961	V. Tregubov

Iraq

—	Preliminary Pulp and Paper Survey - 1953	J. Messines and R. Maronne
169	Eucalyptus Cultivation - 1953	L. Pryor
—	Poplar Cultivation - 1953	E. Allegri
537	Aerial Photographs for Forestry Purposes - 1956	D. A. Stellingwerf
—	Forestry Research - 1957	J. K. Jackson
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1040	Forestry Development - 1959	G. W. Chapman

Jordan

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554	Sawmilling - 1957	V. Hasek
—	Forest Inventory - 1960	D. A. Francis
1291	Forest Management - 1960	J. K. Jackson

Syria

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841	Aerial Photographs for Forest Inventory - 1958	D. A. Stellingwerf

REGIONAL PROJECT

379	Forest Policy Seminar, Turkey - 1955	R. G. Fontaine

Latin America

Argentina

711	Summary of the Pulp and Paper Situation in Argentina - 1957	A. Sundelin
983	El Aprovechamiento de la Madera de Eucalipto - 1959	C. S. Elliot
1019	La Ecología del Eucalipto en Argentina - 1959	M. R. Jacobs
1030	La Reorganización y el Mejoramiento Técnico de la Industria de Envases de la Madera del País - 1959	F. Nájera
1142	El Problema Torrencial - 1959	J. M. García Nájera

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512	Algunos Problemas Forestales - 1956	Ph. Cochin
962	L'établissement de nouvelles industries forestières et la modernisation des scieries - 1959	P. F. Berthon
1241	Producción y Clasificación de la Caoba y otras Maderas para la Exportación - 1960	J. P. Guillard

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171	Forest Development in the Amazon Valley - 1953	K. P. McGrath, R. Gachot and M. N. Gallant
206	Silvicultural Problems of *Araucaria angustifolia* - 1953	L. J. Rogers
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1284	Dryland Forest on the Tertiary and Quaternary South of the Amazon River - 1960	D. Heinsdijk

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1060	Forestry: The Timber Trade in the Caribbean Area, Parts I and II - 1959	M. N. Gallant

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—	Forest Education Program 1952-53 - 1953	P. M. Dunn
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—	Work of the FAO Mission 1952-53	E. I. Kotok
—	Centro Forestal de Investigación y Capacitación de Llancacura - 1956	H. L. Person
466	Cursos de Afilado de Sierras en el Centro Forestal de Llancacura - 1956	C. Proulx
500	Repoblación Forestal y Rehabilitación de la Zona Arida del Norte - 1956	A. Y. Goor
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—	La Industria de la Aserraduría en las Plantaciones de Pino Insigne - 1957	L. A. Hartman
865	Enseñanza y la Investigación en el Aprovechamiento de los Productos Forestales - 1958	C. W. Scott
—	Considerations Affecting Choice of Pulp Mill Sites - 1959	A. Wohlbank
—	La Industria Forestal y sus Posibilidades de Desarrollo en la Explotación de los Bosques Naturales Chilenos - 1956	L. A. Hartman
1192	Misión Forestal de la FAO - 1960	H. Igler, H. Gripenberg, C. Hutchins and F. Knudson

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—	Preliminary Pulp and Paper Survey - 1953	K. A. Forrest and W. R. Barbour

Cuba

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Ecuador

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1118	Estudio de Papel y Celulosa en el Ecuador - 1959	Grupo Asesor en Papel y Celulosa para América Latina
1125	Desarrollo de las Industrias Forestales en las Regiones de Guayaquil y San Lorenzo - 1959	P. F. Berthon

El Salvador

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375	La Silvicultura Hondureña - 1955	E. J. Schreuder
674	La Industria de la Madera - 1957	P. F. Berthon

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—	Economía Forestal de Yucatán - 1952	L. Huguet and J. Verduzco
251	Silvicultura - 1954	D.T. Griffiths
261	La Creación de un Centro de Investigación Forestal y de un Laboratorio de la Celulosa - 1954	P. Bellouard
262	La Industria Resinera - 1954	H. W. Sanderman
263	Entomología Forestal - 1954	F. Hartig
264	Las Posibilidades de Producción de Materiales Tánicos Vegetales en México - 1954	FAO Mission
280	Durmientes - 1954	P. Pöyry
293	El Problema Forestal de México - 1954	L. Huguet
297	La Economía de la Industria de la Madera de Pino - 1954	P. Pöyry
319	Pulp and Paper Research - 1954	H. W. Giertz
—	The Organization of Forest Inventories - 1954	G. H. Bernier
—	Marketing of Forest Products - 1955	M. N. Gallant
556	Investigaciones Celulósicas - 1957	T. E. Höglund
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390	Comercialización de Productos Forestales - 1955	M. N. Gallant
578	Industrias de la Madera - 1957	F. Cermak
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Peru

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1116	La Industria Peruana del Papel y la Celulosa	Grupo Asesor en Papel y Celulosa para América Latina

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—	Afforestation - 1953	L. J. Rogers
1079	Cortinas Protectoras y Rompevientos - 1959	A. Y. Goor

Venezuela

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847	La Prevención y Extinción de Incendios - 1958	R. L. Williams
1115	La Industria del Papel y la Celulosa - 1959	Grupo Asesor en Papel y Celulosa para América Latina

REGIONAL PROJECTS

—	Informe sobre los Recursos y las Posibilidades de Producción de Celulosa y Papel en Centroamérica - 1955	E. J. Schreuder, P. Pöyry and K. Hiilia
—	Forestry Education and Training Project - 1958	A. Hyndman Stein
—	Proyecto para la Fabricación de Celulosa y Papel en Centroamérica - 1959	FAO/CAIS
—	Forest Fire Control Study Tour, U.S.A. - 1952	ECA/FAO

Commodity Report

Pulp and Paper Development in Asia and the Far East

A Conference on Pulp and Paper Development in Asia and the Far East was held in Tokyo, Japan, from 17-31 October 1960, organized jointly by FAO and the United Nations Economic Commission for Asia and the Far East (ECAFE).

Official delegations attended from Australia, Burma, Cambodia, Federation of Malaya, France, India, Indonesia, Japan, Republic of Korea, Mainland China, New Zealand, Pakistan, Philippines, Thailand, Union of Soviet Socialist Republics, United Kingdom, United States of America, and the Republic of Viet-Nam. Representatives and experts from Argentina, Brazil, Canada, Czechoslovakia, Chile, Dominican Republic, Federal Republic of Germany, Finland, Italy, Mexico, Norway, Romania, Sweden, Switzerland also attended the meeting in a consultative capacity, together with a representative of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and observers from the International Confederation of Free Trade Unions (ICFTU), a non-governmental organization.

Mr. Mitsujiro Ishii, Minister of International Trade and Industry, welcomed delegates on behalf of the Government of Japan. He pointed out that in the 90 years since machine paper making was introduced into Japan, the country had become the world's third largest paper producer. By 1970, Japan would be producing 9.6 million tons, nearly twice as much as in 1960. He felt that though, at present, Asian production and consumption of paper was low, the region was rich in forest resources, and that it should not be too difficult to develop the industry once ways had been found of using them. He firmly believed that countries of the region should pool economic and technical efforts to this end.

U. Nyun, Executive Secretary of ECAFE, underlined Japan's importance in the paper industry. He surveyed action in the field of forest resources and pulp and paper development planning by the UN Regional Economic Commissions and specialized agencies. He recalled the success of a similar conference in Buenos Aires in 1954, and was sure that the present conference would be equally successful. It would have a catalytic effect in accelerating the development of pulp and paper manufacturing capacity in the region. He reminded the conference that according to estimates the region's paper requirements by 1975 would be equal to the whole world's prewar consumption. Countries would have to produce more to meet this demand. The industry in the region must find ways and means of using the wide variety of fibrous raw materials available, and the problems involved were a challenge to those gathered at the meeting. The availability of traditional fibres from coniferous woods was limited; but attempts should be made to solve this problem by plantations. He felt that small-scale paper making industries should be encouraged, and that in the case of small countries which did not have sufficient demand or raw materials, joint venture projects might be conceived between neighboring countries.

Dr. Egon Glesinger, Director, Forestry and Forest Products Division, FAO, reminded the Conference that FAO regarded pulp and paper as one of its main responsibilities and that the present Conference was one of a series of actions undertaken by his division going back over the past twelve years. The Conference was important for two reasons: first, because although paper, like food and clothing, was a commodity universally consumed, production had so far been concentrated in a small number of countries; secondly, because paper industries were the largest single producers of value from the forests. Pulp and paper were fast becoming, to the foresters of the world, bigger in terms of value than any other forest product. Consumption of paper at present in the region was 6.5 million tons. By 1965 requirements would exceed 11 million tons, and by 1975 they would have reached nearly 25 million tons. This increase could not be covered by imports. To add, in the next 15 years, around 18 million tons of paper imports was inconceivable, not only in terms of availability and transport, but because it would add roughly 4,000 million dollars to foreign exchange expenditure. If the increased needs were to be met, the expansion would have to come from within the region. There were three problems connected with the expansion of the industry in the region. The first concerned the quantity and quality of raw materials available. The second was that of trained personnel, a problem which could be partly solved if the development of new capacity were to come about as a result of a partnership between those countries which had paper industries and those intending to set up new mills. The third problem was that of capital. It was his hope that this Conference would help toward finding solutions to these three problems.

Discussions at the Conference

Mr. T. Shimoda (Japan) was unanimously elected Chairman of the Conference with Mr. Anondo (Indonesia) First Vice-Chairman and Mr. M. P. Ramiro (Philippines) Second Vice-Chairman.

A committee consisting of representatives of Australia, Canada, Mainland China, Federation of Malaya, France, India, Indonesia, Japan, Pakistan, Philippines, the Union of Soviet Socialist Republics, and the United States of America was appointed to draft the report of the Conference.

Discussing trends in pulp and paper production, consumption and trade, the Conference endorsed the methodology adopted by the Secretariat to arrive at estimates of future requirements — a methodology already approved by the World Consultation convened in Rome in September 1959 — and stressed the value to countries in the region of requirement estimates of this type.

Most Asian countries are in the early stages of industrialization, and the need to mobilize and allocate resources compels them to engage in development planning and to employ a variety of devices for influencing the course and pattern of economic growth. Since the measures they take influence in many different ways the future level of both production and consumption of paper, it is necessary to fix targets, however tentative, as an aid to decision-making. The Secretariat estimates of future requirements offered a valuable starting point.

Many delegates pointed out, however, that the Secretariat estimates were decidedly conservative, since they indicated future levels of consumption which, on the basis of historical and geographical comparisons, are likely to be associated with the achievement of certain income levels, taking into account the close relationship which exists between income and consumption. Requirements so estimated, however, do not correspond to — in fact, fall far short of — basic needs. Many Asian governments therefore, particularly those engaged on illiteracy liquidation programs, are planning or will wish to plan for higher targets. Planning for lower targets, i.e., according a higher priority to development in other sectors, involves deliberate restriction of paper consumption, with its consequential effects on educational, cultural and industrial programs.

The Conference *recommended that pulp and paper demand and capacity trends in the region be kept under continuous review* and urged FAO, in close collaboration with ECAFE and UNESCO, to continue the collection, analysis and dissemination of available data for the benefit of Member Governments of the region. The Conference also *recommended that Member Governments in the region give greater attention to improving the basic statistics needed for such studies and encourage the prosecution of national studies of consumption trends.*

In deciding what priority to accord to the pulp and paper sector in development planning many factors have to be borne in mind. Capital requirements are high in this sector, and special skills are needed. On the other hand, pulp and paper ranks high as an import saver; it generates high value products from indigenous raw material; and development in this sector has an important multiplier effect in generating secondary industries based on paper and in promoting associated industries such as chemicals. While mill operations are rarely labor-intensive, associated operations, whether in the forest or in assuring supplies of nonwood fibre, can provide needed employment opportunities, thereby absorbing surplus rural labor or, in some cases, replacing public works. Moreover, pulp and paper development normally makes possible a needed decentralization of industry and can often help to valorize basic investment in water, power and communications. Most important of all, however, is the fact that inadequate paper supplies will invariably retard development in other sectors.

The Conference noted that national markets for paper in many countries of the region, while small at present, are rapidly growing. From this three things follow. First, in planning new mills the possibility of future expansion should always be kept in mind. Secondly, because it may take five to seven years to establish a new mill, especially if the raw material resource has to be inventoried, it is desirable to initiate development planning now, even though markets today are small, if a critical situation is to be averted later on. Thirdly, the small size of national markets, the economies of scale in pulp and paper production, and in some cases the complementarity of resources between countries, all point to the need for a regional approach and some co-ordination of development programs. The Conference in this connection drew attention to the fact that self-sufficiency might not in all cases be desirable. The achievement of self-sufficiency through high-cost ventures could, for example, lead to the satisfaction of effective demand at a high price level while leaving basic needs unsatisfied. All these points should engage the earnest attention of governments in the region.

While in general the region possesses sufficient fibrous resources to sustain a substantial expansion of the region's paper industry, the Conference drew attention to the fact that in the later decades of this century paper needs will have multiplied many times. Governments of the region have a responsibility for conserving, and where necessary creating, resources of fibre for the future. Since the measures required are essentially long-term, needing decades to take effect, the Conference urged all governments of the region to review their forest policies in the light of these facts and to initiate without delay the measures needed to ensure that raw material shortages shall not lead to restricted paper consumption in the longer term.

The region has made great progress since the war in reducing its dependence on imports of many categories of paper, though a number of technical and economic factors have limited the progress made on newsprint. In spite of the increase in regional paper production, however, net imports into the region have increased. Even if all new projects under consideration should materialize, imports from other regions will certainly be required to supplement domestic production through most of the coming decade. The data available on capacity and demand trends in the traditional exporting regions indicate that the quantities required will be available. Beyond that, however, there is no certainty that there will be export surpluses available elsewhere

of a magnitude to satisfy the rapidly rising needs of the Asian region. What is certain is that the region will not be able to satisfy its paper needs if it has to rely heavily, and increasingly, on imports. For these reasons the Conference *recommended that Member Governments in the region which have not already done so, undertake a careful review of their future needs of paper and take such steps as are open to them to encourage the development of pulp and paper industries in the region wherever the availabilities of fibre and other production factors give promise of the successful establishment of sound ventures in this sector.* It was the considered view of the Conference that, unless positive action of this kind is undertaken, there is a serious danger that current educational programs will be jeopardized, the creation of an informed citizenry retarded, antiquated distribution systems retained, and industrial progress hampered.

Recent technical advances and technology of the future in pulp and paper manufacture

The Conference discussed recent technical advances and the technology of the future in pulp and paper manufacture on the basis of four background papers. These documents all served to underline the rapid technical development which has taken place in the last ten years. This extends to all phases of pulp and paper operations from the harvesting and transport of fibre raw materials to product development. In the discussion, various nonconventional methods of pulp and paper manufacture were described. It was believed that the pace of development will increase still more and will have to be followed closely by those responsible for planning in all sectors related to pulp and paper production.

The discussion centered on the two basic problems: the fuller use of the region's resources of short-fibred raw materials; and the impact of modern techniques on the planning of new pulp and paper mills in the region.

There were many examples of the successful use of short-fibred pulps at high percentages in a wide range of papers. Nevertheless there was an urgent need to increase research in this field within the region. The Conference *recommended that governments of the region avail themselves of international (including bilateral) technical assistance to develop and strengthen their research institutions, and drew attention of governments to the possibility of invoking the aid of the United Nations Special Fund for this purpose.*

The Conference attached particular importance to improving the exchange of information about research programs and findings in the region, and *recommended the holding of regular technical meetings in the region of research workers in pulp and paper together with mill technicians as an efficient means of disseminating information and avoiding duplication of research and technical development work.*

The need for a fuller consideration of the basic properties of short fibres and for using these properties to advantage in paper manufacture was stressed. Quality standards and specifications should not in all cases be patterned on those which have been developed on the basis of long fibred pulps and should not be set up until considerable experience has been accumulated within a country.

The Conference stressed that modern techniques should be employed in new mills to be built in the region. This does not necessarily imply that mechanization and automation should be used to the same extent in industrially advanced and less advanced countries. But full advantage should be taken of recent technical advances which have improved the efficiency of the operations. It was further noted that pulp and paper mills, being capital intensive, cannot of themselves play a major role in solving unemployment problems. In this respect forest operations afford greater possibilities, but even here steps should be taken to raise labor productivity by the provision of improved tools.

It was noted that continuous pulping offers advantages in many cases. Attractive features are low investment cost and ease of operation and control.

Further rapid developments toward smaller, efficient pulp and paper units can be expected. This will tend to increase the difficulty of selecting equipment. The Conference stressed the importance of making thorough preliminary studies, using qualified specialists, especially when embarking upon a project involving the use of new techniques. It was further noted that there was real need in the region for continuous objective evaluation of new processes.

Fibrous raw materials supply and economic availability

The Conference discussed the region's fibrous raw materials supply and economic availability, based on Secretariat papers and the case studies carried out in India, Burma and Thailand by the Stanford Research Institute and the ECAFE/FAO Secretariat.

The Conference had already decided that the rapidly rising needs for paper and boards — a four-fold increase over the next 15 years in consumption in the Far East (excluding Mainland China) and a doubling in Oceania — would have to be largely satisfied by indigenous production the basic prerequisite of which is the availability at reasonable cost of suitable fibrous raw materials. The Conference therefore discussed the availability of wood, bamboo, bagasse, straw, grasses and other possible fibrous raw materials, with particular reference to the following questions:

1. What amounts are needed?
2. What raw materials are available in each subregion?
3. Can they be made available in sufficient quantities at economic prices to meet minimum requirements of long-fibred chemical pulp and groundwood type pulp?

The Conference endorsed the Secretariat estimate of potential fibrous raw material requirements: these implied a need by 1975 of over 32 million cubic meters

of wood, 1.8 million tons each of bagasse and bamboo, and over a million tons of straw and grasses in the Far East (excluding Mainland China), and 3.8 million cubic meters of wood in Oceania.

The following were the conclusions on the availability of the various raw materials:

(*a*) *Wood.* The prospects of supplies of short-fibred wood pulp were generally better than long-fibred pulp from conifers, but pulpwood from existing mixed tropical forests would in many cases be more expensive than such alternative raw materials as bagasse or rice straw. It was also likely to cost more than pulpwood from existing or potential plantations of indigenous or exotic fast growing species. However, tropical forests should be studied with a view to increasing their productivity of pulpable species. The utilization of wood residues should also be kept in view.

(*b*) *Bamboo.* Bamboo pulp was likely still to be the main substitute for coniferous chemical pulp, because in countries where both were available bamboo would often be cheaper than pines from natural stands. Resources for large-scale expansion of pulp production were available in South Asia and continental Southeast Asia; the largest untapped source, capable of yielding several million tons a year, is the bamboo in Burma. Bamboo from artificial plantations might prove even cheaper than from natural stands.

(*c*) *Grasses.* This region contains many grasses and reeds which are suitable as pulping material. The economics of their utilization should be investigated.

(*d*) *Bagasse.* Over most of the region, bagasse was likely to be the cheapest short-fibred material available in large quantities. A considerable expansion of bagasse pulping was foreseen.

(*e*) *Straw.* Straw was not likely to become an important raw material in the over-all supply, but was capable of supporting a limited expansion in small and medium-sized mills in continental and insular Southeast Asia and in East Asia.

A Secretariat paper was also tabled providing an example of a study of economic availability of various raw materials in different countries for different potential mill sites. The Conference invited the attention of member countries to the methodology used, which, by comparing the cost of each raw material in terms of a ton of bleached pulp at each potential mill site, helped in the choice of mill site; in the determination of the best combination of raw materials; and of mill capacity, by indicating the effect of increase of capacity on the average cost of raw materials delivered at mill site.

The following main conclusions were agreed:

1. Over-all potential supplies of raw material are more than sufficient to cover estimated needs up to 1975 and even beyond.
2. Each subregion seems capable of satisfying its own needs, with the possible exception of East Asia.
3. Except in East Asia, raw materials could be made available at prices comparing favorably with those in western countries.
4. Three outstanding sources of supply exist; the untapped bamboo reserves in Burma; the industrial bagasse in South and East Asia, and existing and possible future plantations of broadleaved and coniferous species in continental and insular Southeast Asia and East Asia.

In many countries the basic data required for analysis do not exist. The Conference therefore *recommended the initiation of the following studies without delay:*

(*a*) reconnaissance inventories of forests;

(*b*) detailed inventories, capable of providing data on stocking, species and growth of selected forest areas shown by reconnaissance to have industrial potential;

(*c*) economic appraisal and feasibility surveys of data in relation to potential mill sites.

The possibility of obtaining financial assistance from the United Nations Special Fund for the prosecution of such preinvestment studies should be kept in mind.

With a view to creating new resources which will undoubtedly be needed in many areas in the longer term, the Conference reaffirmed that a careful reappraisal and revision of forest policies was necessary. It endorsed the recommendation made by the recent Fifth Session of the Asia Pacific Forestry Commission in regard to the Timber Trends Study recently undertaken by FAO and ECAFE. Creation of plantations of fast-growing species and conversion of natural mixed forests into stands of more suitable species was urged. New Zealand was cited as an example of the growing of man-made forests of exotic species (*Pinus radiata*) geared to industry needs.

Other prerequisites for pulp and paper production

The short statement made by delegates from countries of the region indicated that most countries are fairly well situated with regard to the supplies of various chemicals required for the manufacture of pulp, paper and paperboard to meet their present and future requirements. Countries at present deficient in certain chemicals could obtain these by intraregional trade or by imports from Europe and America or by exploitation of their own potential resources.

The Conference approved the procedure adopted by the Secretariat for estimating the total requirements of various chemicals for each subregion. It was suggested that the tables be amplified and revised if pulping processes other than those indicated in the Secretariat paper were adopted in mills in the region.

As regards recovery of chemicals from spent liquors of digestion the opinion of the Conference was that

recovery plants for units smaller than 50 to 60 tons per day were uneconomical due to the proportionately high cost of the plants. It was pointed out, however, that research was currently in progress for the development of processes and plants for the recovery of chemicals and heat from spent liquors from small units (10 to 15 tons per day) and that installation of such small recovery plants is likely to be an economically feasible proposition in the near future.

Suggestions on the production and availability of the required quantities of chemicals in individual countries and the estimated requirements of water, steam power, fuel and transportation facilities given in Secretariat Paper IV were generally approved.

One obstacle to the expansion of pulp and paper production in the region is the dearth of qualified and trained technicians, engineers and technologists. The Conference stressed the need to expand technical training facilities in the region at all levels. The Conference heard reports of work already done in this field by UNESCO and ILO and noted the contributions which these agencies could make toward extending technical training programs in the region.

The Conference *recommended that the United Nations agencies concerned should collaborate in the preparation of a directory of training facilities available.* Delegates from countries both within and outside the region outlined the facilities available in their countries, and indicated their willingness to accept students and trainees from other countries at their national institutions and also to accord mill training facilities. FAO and ECAFE would continue to assist countries desirous of obtaining facilities for testing fibrous and auxiliary raw materials respectively for paper-making.

Technical and economic aspects of pulp and paper production

The Conference discussed on the basis of twenty-nine background papers and a Secretariat paper, many aspects of the technical and economic problems involved in pulp and paper manufacture. These papers presented the results of experience gained not only in the Far East but also in other areas of the world, both in highly developed industrial countries and in developing countries. They covered the various processes and equipment available for manufacture of pulp from wood, bamboo, bagasse, straw and other fibrous materials available in the area.

The discussion placed emphasis on the possibility of producing both groundwood-type pulps and high strength pulps from the raw materials available, having regard to the limited availability in the region of coniferous woods from which these types of pulps have been traditionally produced. It was pointed out that methods already exist for producing mechanical type pulps economically from certain short-fibred hardwoods and bagasse. Pure mechanical pulp and chemi-groundwood pulp, as well as cold soda mechanical type pulp, are already being produced in the area from certain hardwoods, and one mill is planned to use bagasse mechanical pulp. However, improvements in the methods of utilizing these raw materials are needed and more attention should be given to development work in this field.

As regards the production of high strength pulps, improvements in present processing methods are vital if a sufficient amount of this quality pulp is to be produced in the area. It was brought out that even in the case of bamboo, which is the predominant long-fibred raw material in the area, truly high strength pulps were not yet being produced. It was agreed that the preparation of the raw materials before digestion had an appreciable effect on the quality of the pulp and that better methods of removing extraneous components of the raw material both before and after digestion were desirable.

It was noted that in determining the utilization of these various short-fibred raw materials, consideration must be given to other properties of the fibre besides length. Cell wall thickness and presence of nonfibrous elements, for example, are factors in determining the usefulness of the material and the strength to be obtained. Research was needed on the possibility of separating out the fibres of superior length or strength by either mechanical means or by fractional digestion.

The matter of continuous versus batch digestion methods was discussed; the prevalent trend was toward continuous cooking methods of ever shorter duration, with emphasis upon proper impregnation of the raw material before digestion. Research to bring about faster and more thorough penetration of raw materials was urgently required.

It was noted that equipment for screening, washing, stock preparation as well as paper machines, are available which can be used to produce paper using a high proportion of short-fibred pulps. However, certain modifications might with advantage be made to handle new raw materials and efforts should be made to improve the design of equipment with these particular raw materials in mind.

The use of longer machine wires, high vacuum, transfer rolls between the wire and first press, improved press roll covers to reduce picking were mentioned as being helpful in handling short-fibred pulps.

The Conference agreed that the ratios of short-fibred to long-fibred material for over-all future pulp requirements assumed in the Secretariat paper were realistic as a basis for future planning to 1965 and 1975.

As regards longer-term fibre needs, steps should be taken to plant tree species which have the proper fibre characteristics to produce the best types of mechanical pulp and high strength pulp. Certain morphological characteristics can be used to suggest the probable pulping qualities of particular trees or species and close attention to these characteristics can serve to eliminate many species from consideration without extensive pulping tests.

Investigations for the selection of the most suitable species from mixed tropical forests with particular

regard to their propagation, together with genetic studies, were needed to ensure a future supply of pulpwood with appropriate fibre characteristics.

Discussion next centered on the capital cost of new pulp and paper mills of various sizes. Figures furnished by different sources conflicted. Representatives of different countries in the region gave capital cost data based on mills already built or under construction which showed considerable divergence.

It was impossible to give estimates to cover all circumstances; accurate estimates must be made for each location after a thorough technical and economic investigation. For estimates of equipment costs from different sources to be comparable they must relate to the same specifications. The Conference *recommended that the Secretariat collect and disseminate additional capital cost information including specifications for mills of various types and sizes*, so that estimates furnished by suppliers in the various machinery supplying countries might be comparable. The Conference also invited FAO to bring up to date and re-issue the publication *Raw materials for more paper* (FAO Forestry and Forest Products Study No. 6).

Before embarking on any project, competent advice is needed. Such assistance and specialized knowledge can be obtained from a variety of sources: from existing mills, consulting engineering firms, individual consultants, machinery manufacturers or over-all contractors.

Questions of mechanization and labor productivity were discussed. It was pointed out that, in spite of comparatively low labor costs in the region, there are still important incentives toward mechanization and the highest possible productivity. It was noted that, where the question of employment opportunities was important, some sacrifice of labor productivity might be entailed. In any event, new industries should be given the opportunity to start with the most modern installations.

Newsprint

Discussing the special problems of newsprint supply and demand in the region, the Conference noted that in many countries present consumption is lower than it should be in relation to their levels of economic and cultural development. On the basis of material presented in a Secretariat paper and four background papers, the possibilities of satisfying the rapidly growing needs for this commodity, using indigenous and nonconventional fibrous raw materials were discussed.

The Conference considered that the demand estimates presented in the Secretariat were probably on the low side for many of the countries of the region. The aim of every country in the region should be to facilitate the spread of information at the lowest possible cost to the public. The Conference noted that in the developed countries this was to a large extent made possible by advertising revenues. In the less developed countries, however, such revenues were usually small, and the price of newsprint therefore had more effect on the final cost of the newspaper. In this context, the Conference observed that in many of the countries, current distribution methods tended unnecessarily to increase the cost of newsprint, especially to small publishers.

The question of characteristics desirable in newsprint was discussed, and the Conference agreed that these cannot be defined by minimum standards of specific properties. Acceptable standards may vary considerably, depending on the specific conditions under which the publisher is working and the printing equipment used, but quality should be uniform.

The Conference endorsed the view expressed in the Secretariat paper that pulping processes are today available which allow the economic production of groundwood-type pulps from a wide variety of broad-leaved woods. These processes are now in commercial use for newsprint manufacture, both in the main paper producing regions of North America and Europe, as well as in some of the countries of the Far East. It was pointed out, however, that in most areas mixed tropical forests will not be an economic source of wood supply for such production, since in these forests the proportion of suitable species is usually low. The mangrove forests, which frequently contain a high percentage of light-colored, low-density species, are exceptions to this rule. The Conference concluded that — using wood as raw material — the best economic results are likely to be obtained by establishing plantations of fast-growing species — coniferous and broad-leaved — with suitable characteristics.

Discussing the possibilities of manufacturing newsprint from bagasse the Conference considered that such production is not economically and technically feasible if based primarily on the use of full chemical pulp. Views were expressed that to achieve acceptable economics of production and desirable paper characteristics, at least half of the fibre furnish must consist of mechanically produced pulp. There was considerable interest in the announcement that a newsprint mill using mechanical pulp from bagasse was under construction in India.

Discussing the economics of production, it was agreed that the economies of scale were particularly pronounced in the case of newsprint manufacture. Newsprint mills established in these countries with daily capacities of less than 150 to 200 tons would be able to compete in price with imported newsprint only if operating under favorable conditions. The Conference therefore concluded that, in those countries where the newsprint market is small, self-sufficiency in the supply of newsprint is not always a desirable aim. It was observed, however, that the economics of production may often be improved by integrating production with the manufacture of other paper grades; for instance, mechanical printings. The Conference *recommended that the possibilities of establishing regional production centers, as recommended by the UNESCO meeting on the development of information media in Southeast Asia held in Bangkok in January 1960, should be fully explored.*

The Conference stressed the importance of preinvestment studies in the case of newsprint projects. The

heavy investments involved and the need to keep the price of the product at the lowest possible level require careful planning of the mills, including laboratory tests, mill trial runs of nonconventional raw materials, and economic feasibility studies to ensure that the most advantageous solution technically and economically is reached. It was also emphasized that the expansion of existing mills is generally a cheaper way to meet the growing demand than the establishment of new production facilities. This, again, underlines the desirability of a regional or subregional approach in planning.

Although the Conference concluded that fibrous raw materials for the production of newsprint could be made available at a reasonable cost to cover the estimated needs in the next 15 years, it stressed the importance of immediate planning for long-term future needs. The Conference *recommended that governments of the region should investigate the possibilities of establishing plantations of fast-growing wood species suitable for the manufacture of newsprint in appropriate locations.*

Collection and utilization of wastepaper

The recovery of waste paper could meet more than one quarter of the fibre furnish in the region and in fact nearly one third of this need in some countries.

The direct re-use of waste paper without processing for wrapping purposes, should not be encouraged because it was considered unhygienic, but it seems difficult for many countries to prevent this practice.

The development of local manufacture of cardboard might present suitable opportunities in these countries where there existed an adequate supply of waste paper.

The development of the production of special kinds of wrapping paper, specially coated with plastic, wax, etc., or faced with plastic and metal foils did not appear to be a great factor for lowering the recovery rate of waste paper, but it would be desirable to indicate clearly to the people engaged in the business of waste paper recovery that this kind of paper would have to be carefully sorted out during their collection, in order to avoid difficulties in pulping the waste paper recovered.

In the countries in which the paper and paperboard industry is at an early stage of development, a very simple classification of waste paper such as the following should be useful:

(*a*) trimmings from printing presses;

(*b*) trimmings from book binders;

(*c*) waste paper from government offices;

(*d*) old newspapers.

In the context of the conditions prevailing in the region the promotion of the hand-made paper industry merits consideration, particularly to provide part-time or full-time employment.

Such speciality grades as command good prices, possess artistic value and do not involve competition may receive particular attention. However no restriction should be imposed on the hand-made paper industry to limit its field.

In favorable situations and with improved technology it should also be free to make varieties corresponding to mill-made varieties. In suitable cases, governments may consider reserving certain varieties of production for the hand-made paper industry.

Governments should also assist by way of research, and by advancing funds. Direct subsidies were not considered essential, if technical advances were made on proper lines.

The tools and the techniques of operation should be rapidly improved. For this, free exchange of information was considered desirable, and the ECAFE Secretariat was requested to collect and disseminate information. The need for market research was also emphasized but no particular opinion was expressed about central pulping units.

Small-scale industrial pulp and paper production

There can be no hard and fast rule about the economic size of a small-scale mill. This will depend on local circumstances and the nature of the project, i.e., whether it is a pulp or paper or integrated mill.

Even in the industrialized countries, a large number of small pulp and paper mills exist. In most cases, these mills, which often comprise 80 percent of the total number, account only for some 10 to 25 percent of the production volume. Some small mills are still operating profitably without substantially changing their equipment or mode of operation, while other mills, when exposed to competition from larger units, have had to modernize or to switch to other products. On the other hand, a number have closed down. Against this historical background, the plans in several countries of the region for encouraging small-scale pulp and paper manufacture were discussed.

The following were favorable aspects of small-scale operations: utilization of local fibrous raw materials and reduction in transport charges; sale of final products locally with lower distribution costs; ready adjustment to local market requirements; adaptation to limited water supply; requirements for a smaller number of highly trained technical personnel and skilled labor; relatively small capital requirements; use of locally made machinery; geographical disposal of employment opportunities. In areas where there is no existing pulp or paper mill, a small-scale plant can often be the means of initiating such an industry. The quality need not necessarily suffer in a small-scale plant.

Market pulp production does not generally lend itself to small-scale operation. Speciality paper mills may or may not be integrated, whereas small wrapping paper and strawboard mills should normally be integrated units. In some instances considerable economic advantages may accrue from integration of a small paper unit with a larger pulp mill and even *vice versa.*

There were many technological developments which tend to make feasible and economic manufacture on

a smaller scale than is at present considered desirable. Among these are a marked improvement in the availability of suitable equipment, and the development of suitable processes. Research findings reported to the Conference indicated that further progress was in sight.

Small pulp and paper mills were particularly suited where raw materials were only available in limited quantities, especially such raw materials as straw, wastepaper, rags and grasses.

Of the several processes which can be used for pulping these raw materials, in principle, processes requiring only simple equipment and with low chemical consumption are to be preferred. Among methods with a low consumption of chemicals which need not be recovered was the bisulphite process. A reduction in the consumption of chemicals in rapid cycle Kraft processes might become feasible.

In most countries there is a need for both large and small units. Speciality papers, such as cigarette, electrical and currency papers are almost universally produced in relatively small units, as often are strawboards, tissues and a few other grades of paper and board for local consumption. On the other hand, commodities such as newsprint and certain Kraft papers produced from major raw material resources such as wood, bamboo and bagasse do not lend themselves economically to small-scale production. Some countries within the region are planning to produce a larger share of the total production in small units. While fully recognizing the several advantages offered by small-scale production, the Conference endorsed the principle that this should be regarded as a phase in the development of the industry. Consequently, some of the new small mills should be planned around raw material resources which were likely to remain limited, with the ultimate goal of producing, in these mills, speciality papers and certain boards. Other small mills should be designed from the outset to allow expansion at least to medium size as demand grows, and the development of a permanent supply of primary raw materials for a number of these mills should be planned.

The Conference concluded that among the prerequisites for successful small-scale operation were:

1. capital costs kept to a minimum by depending on purchased power and water and by simple disposal of spent liquors; public facilities for transport available as well as community facilities, such as housing for personnel;
2. low raw material costs;
3. the availability of a local market to reduce transport and distribution costs.

Pulp and paper equipment manufacture

The Conference discussed the equipment needs of the region in different sectors of the paper industry large, medium and small-scale mills. It noted the program of procurement from outside sources initially and of manufacture within the region of the equipment needs for the development of this industry during the next 15 years. The design of equipment requires further studies from the point of view of the raw materials available and of the sizes of equipment desired for the region.

The Conference emphasized the possibility of manufacturing small units within some of the countries of the region, the possibility of improvements in design to suit the typical requirements of unconventional raw materials, and noted the supply potential of the equipment manufacturers within the region.

In certain industrially advanced countries, consulting and engineering concerns have formed groups to undertake special studies of equipment needs of the region.

The Conference was pleased to note the promise of co-operation extended by certain advanced countries outside the region in meeting these requirements and of assisting countries of the region in machinery manufacture.

The cost of equipment was likely to be above world prices to some extent in the early period of indigenous manufacture, but in due course the cost may even come down below that level. The Conference considered that the necessity of engineering services should not be underestimated. If necessary, the countries of the region could obtain these from advanced countries.

Because of lack of machinery manufacturing facilities in the region, paper mills faced delays in the procurement of spare parts and consumable mill supplies.

The Conference took note of ECAFE Resolution No. 31 (XVI) on regional economic co-operation for development of trade and industries, which urges countries in the region to co-operate with each other and jointly set up machinery manufacturing factories, and also urges countries outside the region to assist the countries in the region with know-how and capital for such factories. The Conference *recommended that countries of the region, where circumstances warrant, should plan to manufacture pulp and paper machinery and mill stores, starting with simple items, in accordance with that resolution.*

Development prospects and investment needs

The Conference reviewed the investments that would be needed up to 1975 to achieve an expansion in capacity sufficient to meet rising paper needs. The following figures were considered (over and above projects presently being implemented): for the region as a whole (excluding Mainland China): $4,500 million over the next 15 years, or roughly $200 million annually to 1965, and $350 million annually in the ensuing decade.

If the industrially developed areas (Oceania and Japan, where much of the expansion could be achieved through self-financing by existing industry) were to be excluded, the figures were: $75 million annually to 1965, and $95 million annually in the ensuing decade, making

a total of $1,300 million to 1975. Foreign exchange requirements would account for about half the latter figures and thus correspond roughly to the value of one year's production from the total capacity expansion required.

The size of this expansion both warranted and required the early development of a pulp and paper equipment manufacturing industry in the region; this is specially important in view of the fact that considerable amounts of foreign exchange will be required to import not only capital equipment but also recurring requirements of spare parts and consumable stores.

Statements by delegations made it clear that the limited availability of private domestic capital constituted an obstacle to achieving the required expansion in some, though not all, countries of the region. Most governments were taking steps to encourage private enterprise to enter this field, but it was evident that, given the key importance of adequate paper supplies to industrial and cultural progress, public enterprise would assume the initiative if private capital proved reluctant.

Nevertheless, the Conference believed that substantial participation by foreign capital would be required. International lending institutions and government-to-government loans could help greatly, but private equity capital from overseas had a special role to play. As a growing industry, pulp and paper offered a steady and expanding market; foreign capital could bring needed know-how and managerial skills, while helping to overcome any difficulties involved in a development that depended heavily on nonconventional raw materials and new processes. Capital arising in this industry overseas and seeking new outlets could find remunerative avenues in supporting the development of pulp and paper industries in Asia and the Far East.

However, certain safeguards were necessary, on both sides, if a freer flow of capital was to occur; on the one hand, provision for transfer of dividends and repatriation of capital, etc., and on the other, patience, moderation, and genuine understanding of the problems which confront countries in the early stages of development. The Conference noted with great satisfaction the statements made on behalf of all the participating countries with established pulp and paper industries. These statements in all cases showed that the reasons compelling a rapid development of the industry inside the region were fully understood, and contained offers of help, including technical advice and training and research facilities. While the hope was expressed that foreign capital would be forthcoming on an increasing scale to supplement the region's own resources, and the desirable features of joint ventures were stressed, the Conference recognized that the major part of the expansion must rely on domestic capital.

The Conference noted that a mill promoter may either (*a*) develop the project himself, hiring his own personnel and purchasing his own equipment, making use of the services of a consulting engineer, or (*b*) collaborate with an experienced pulp and paper manufacturer, relying on the latter for technical advice and guidance, or (*c*) place a contract for the complete mill, or for the equipment only, with or without erection and supervision, frequently on a " package deal " basis. Arrangements (*b*) and (*c*) may provide for financial participation by the collaborator or contractor. In all cases the promoter must ensure that competent technical advice and arrangements for training local staff are included in the arrangement or are otherwise provided for.

Before capital could be attracted to specific projects, long and costly investigations were necessary, ranging from reconnaissance surveys followed by detailed inventories of the fibre resource, laboratory and pilot tests, studies of availability of power, water, chemicals, etc., to market surveys and feasibility studies for suitable mills in appropriate locations. While in some cases the entrepreneur might carry out these studies (to verify and extend existing information) the Conference *recommended that governments should acquire their own basic data.* This would help them to attract capital, to weigh the advantages of alternative projects, and to negotiate eventual projects on more equitable terms. This was particularly important in respect of fibre resources, since every government in the region had a responsibility for the conservation and proper management of these resources. The hope was expressed that the United Nations Special Fund would be able to assist governments in conducting these preinvestment surveys.

The Conference noted the importance of integrating development planning for pulp and paper with over-all development plans. Having regard to the considerable influence of infrastructural investment on the economics of pulp and paper manufacture, the Conference *recommended that governments, when planning their basic investments in roads, railways, power, water, etc., should keep in mind the desirability of so orienting these investments as to ensure that fibre resources suitable for the establishment of pulp and paper mills could be brought within economic reach.*

The various multilateral and bilateral technical assistance programs represented a significant inflow of capital — in the form of know-how, equipment, fellowship and training facilities — into the region. Many delegates suggested improvements that might enable these programs to contribute more effectively to the development of the pulp and paper industry in the region. A familiarity with and understanding of the problems of developing countries were the first essentials, and an appropriate representation of countries of the region on international staffs would be one means of achieving this.

Reviewing its earlier findings, the Conference confirmed that a general striving for national self-sufficiency in pulp and paper in the region would not represent an optimum utilization of the region's resources, and drew the attention of member governments in the region to the desirability of adopting a regional approach to this problem, notably in respect of newsprint production.

The offer of ECAFE to assist in such joint projects, if the governments concerned so desired, was noted.

The Conference heard reports of national development plans for pulp and paper expansion, and noted that FAO had been charged with the task of studying capacity and demand trends on a world basis. Believing that development prospects in the Far East region should be kept under close and continuous review, the Conference invited ECAFE and UNESCO to collaborate with FAO in collecting, analyzing and disseminating this information, and in affording opportunities for periodic inter-country consultations.

Finally, the Conference expressed concern at the inadequate attention so far given to the conservation and creation of adequate fibre resources for longer-term needs, and invited governments of the region to give due weight to this aspect in developing their over-all land use plans and programs.

Customs and tariff policies

The Conference took note of the tariff levels affecting various categories of paper and board in certain countries of the region. While recognizing that the broad questions of tariff policy could not be considered within its sphere of competence, and that government policies in this matter could only be decided by the governments themselves in the light of national requirements and international obligations, the Conference drew attention to certain factors which should be borne in mind if the desired increase in paper consumption and production and general industrial expansion were to be achieved.

(*a*) So long as countries are largely dependent on imports of paper to meet their domestic requirements, liberal tariff and trade policies should be adopted for those categories of paper considered most essential to national educational, cultural and industrial programs. Newsprint, book-paper and certain speciality industrial papers and boards were cited as examples.

(*b*) The expansion of local manufacture would be facilitated by low tariffs on equipment.

(*c*) The viability of newly established operations depended on the low-tariff entry of the imported key production items, namely, chemicals, mill stores, and in some cases fibrous materials including pulp. A reasonable level of protection for the finished product might be necessary, but the interest of the consumer should not be overlooked.

(*d*) Any form of assistance to new industry, whether in the form of tariff policies, subsidies, tax exemptions, or in other ways, should always be accompanied by vigorous and continuous government scrutiny of operating and marketing costs.

The Conference stressed the importance of adequate and cheap supplies of paper for educational and economic development programs, and expressed the hope that governments would pay attention to this matter in formulating and revising their tariff policies.

J. C. W.

The University "Francisco José de Caldas," Bogotá, Colombia, has awarded the title of Doctor Honoris Causa in Forestry Sciences to **Egon Glesinger**, Director of FAO's Forestry and Forest Products Division.

This distinction comes from a country that occupies a leading position in South American forestry, due not only to the extent of its forest resources but also to its progress in the field of forestry education. The achievements cited in the University's official resolution indicates the extent to which the distinction conferred on Dr. Glesinger is a proof of Colombia's recognition of the role that FAO has played in furthering the progress of Latin-American forestry.

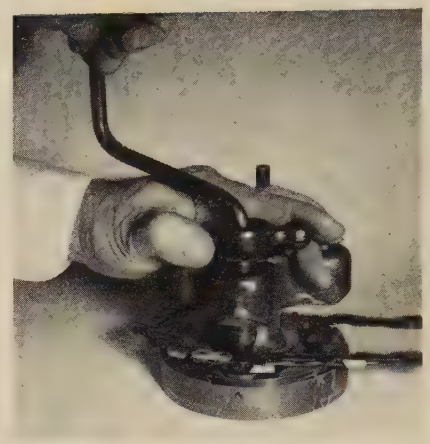
Equipment Section

Lokomo Ditch Plow. — Built for operating in swamplands in Finland. Heavily constructed, works under the most severe conditions. Requires tractor of 10 tons with broad tracks. Equipped with coulter disk located between wheels, held in cutting position by pulling effort of tractors. Rises freely over rocks or immoveable objects. Ditch depth controlled by removable pin. Plow is raised from ditch by pulling a lift lever. Specifications: weight 4,000 kg.; transport width of plow 2.8 m.; length 6.5 m.; plowing width 2.8 m.; plowing depth (max.) 90 cm.

MANUFACTURER: *Lokomo Oy, Tampere, Finland.*

Loggers' Tape. — For use in woods or mill. Steel tape with white background, black numbers - 146 in. (360 cm.) long, rewinds itself every time. No gap round rim of reel for dirt to enter. By loosening six screws on locking ring the spring cover can be revolved to set correct tension when installing new tape, or change stopping point to desired length.

MANUFACTURER: *Spencer Production and Sales Co., 306 Cleveland Street, Pullman, Washington, U.S.A.*



Bench Chain Breaker with Rivet Spinner. — The bench chain breaker with rivet spinner comes with standard equipment as follows: 3 breaker anvils, one each for $^4/_{10}$, $^7/_{16}$ and $\frac{1}{2}$ in. (1, 1.1 and 1.25 cm.) pitch chains, 1 punch, 1 rivet spinning assembly, 2 spinning anvils, 2 spinning heads, 1 pivot and 1 wood screw for attaching base to work bench.

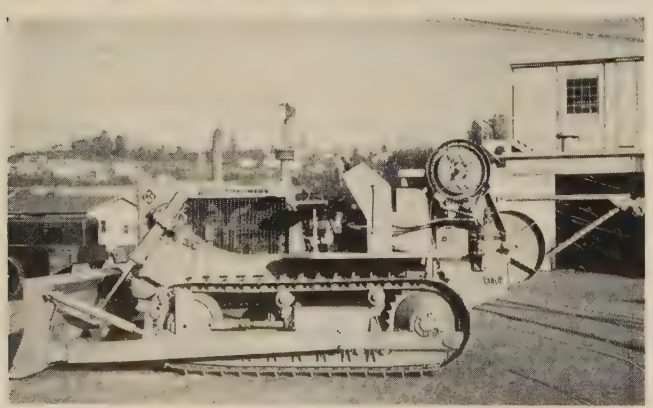
MANUFACTURER: *Bluejet Corp., Hopedale, Mass., U.S.A.*

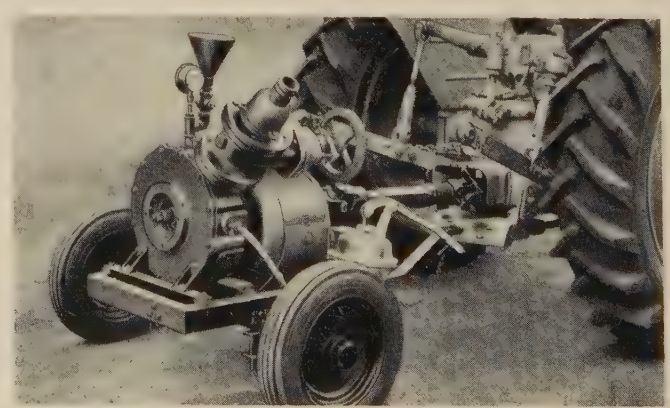
Carco X-2 Yarder. — Designed for mounting on largest crawler tractors, this yarder is mainly used for high-lead system. Waterfall pattern of the drums, placing the main drum far forward of haulback drum, provides practically vertical lead off both drums. Can be operated right at the base of a spar tree or portable spar. Specifications: 4-speed, barrel diameter: main drum 16 in. (41 cm.); haulback drum 12 $\frac{1}{2}$ in. (32 cm.); straw drum 8 in. (20.3 cm.). Length of barrels: main drum 29 $\frac{3}{4}$ in. (76 cm.); haulback drum 30 $\frac{1}{2}$ in. (77 cm.); straw drum 10 in. (25 cm.); gross weight 16,000 lb. (7,000 kg.).

MANUFACTURER: *Pacific Car and Foundry Co., Renton, Washington, U.S.A.*

Tractor P.T.O. Irrigation Pumps. — Morrison P.T.O. pump and spray irrigation kit used where the water source is in a number of places round the farm and where the capital cost of equipment must be kept down. Enables the tractor to be used for irrigation purposes. Powers used are similar to those produced by engine; gearing in pump must be of size and strength equal to gears of tractor. Pump chosen must not overload tractor engine. Pump assembly built on 2-wheel trailer of prefabricated steel. Whole assembly on 2 pneumatic wheels and tires.

MANUFACTURER: *Morrison Pumps Ltd., Loughborough, Leics., U.K.*





Reversible Saw. — Tungsten carbide-tipped saw which will cut boards in either direction. Motor can be reversed at each pass so that the leading edge of the saw is always entering the cut. Normally saw cuts downward on one pass and upward on reverse. Sawdust thrown downward in whichever direction head is traveling.

MANUFACTURER: *C. D. Monninger Ltd., St. Anna Works, Overbury Road, London, N. 15.*

Minneapolis Moline Chain Saws. — Direct drive chain saws have either magnesium or pressed steel frames, automatic or thumb operated oilers, spark arrestor chrome chain guard sawdust deflector. Powered by 2-cycle gasoline engines from 4.7 to 8.1 cu. in. (77-133 cm^3). Manufactured in 5 models with bars in lengths from 16 in. (41 cm.) to 48 in. (121 cm.) and one 15-in. (38-cm.) plunge bow. Weight, less bar and chain, 20 to 25 lb. (9.1-11.3 kg.).

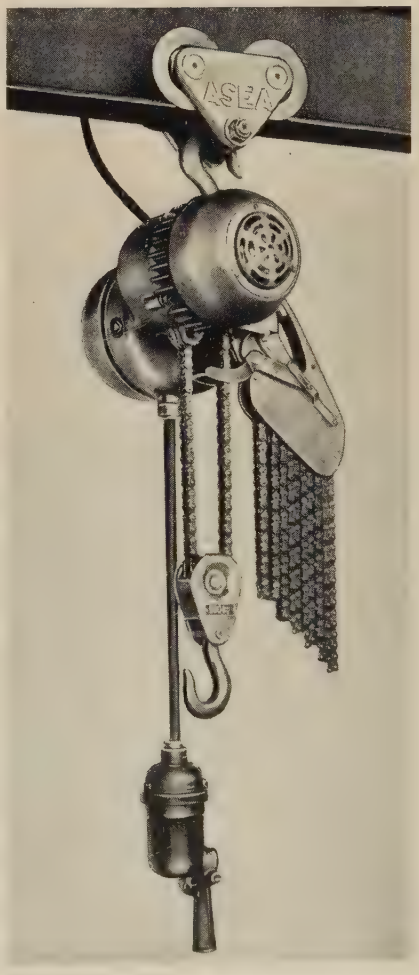
MANUFACTURER: *Minneapolis Moline Special Products Division, Hopkins, Minnesota, U.S.A.*

Chain Hoist. — Chain Mini Hoist type TEA available either as stationary or traveling unit for running along on an I-beam. Model TEA 031: load 250 kg.; max. lift 6 m.; weight 32 kg. (71 lb.); hoisting speed 2.5 to 10 m/min. Model TEA 032: load 500 kg.; max. lift 4 m.; weight 36 kg. (80 lb.); hoisting speed 1.25-5 m./min.

MANUFACTURER: *ASEA, Box 420-40, Stockholm 42.*

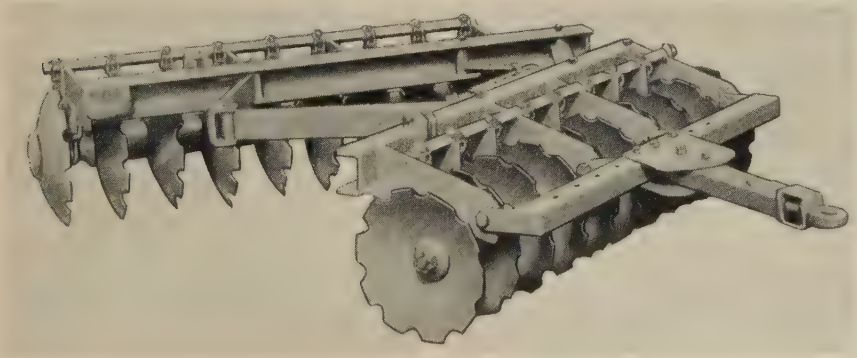
Portable Metal Detector. — Cintel transistorized portable metal detector is an electronic instrument. Detects presence and shape of magnetic or nonmagnetic metal objects concealed in any nonmetalic substance. Three separate parts housed in portable case: search head, amplifier and head. Works with 1.5 volt batteries. Weight: large size 19 lb. (8.26 kg.); small size 9 lb. (4.05 kg.).

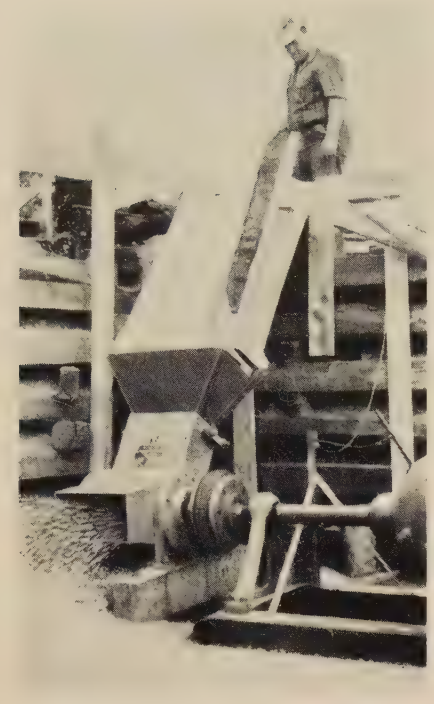
MANUFACTURER: *Rank Cintel Ltd., Worsley Bridge Road, Lower Sydenham, London S.E.*



AMCO Brushmaster. — Heavy duty disk plow for land clearing can be equipped with 16 28-in. (70-cm.) or 30-in. (76-cm.) or 20 28-in. (70-cm.) or 30-in. (76-cm.) disks on 13-in. (33-cm.) spacing with $^3/_{16}$-in. (0.47-cm.) reinforcing disks on each blade. Cuts from 8 ft. 6 in. (2.5 m.) to 18 ft. (5.4 m.); weight 6,800-8,000 lb. (3,085-3,629 kg.).

MANUFACTURER: *Alexander Manufacturing Co., 1 Amco Drive, Picayune, Miss. U.S.A.*





Chipper. — Unit normally used to dispose of brush in forests. Model has been manufactured in conjunction with sawmill. Can be used as vertical or horizontal feed for slabs and edgings disposal. Manufacturer claims that slab 15 in. (38 cm.) wide and 10 ft. (3 m.) long is chipped in less than 20 sec. Special serrated blades sharpened only every other day of operation.

MANUFACTURER: *Fitchburg Engineering Corp., Fitchburg, Mass. U.S.A.*

Hydraulic Crane. — Teale model 200 hydraulic crane can be mounted on almost any truck with curb weight of 5,500 lb. (2,495 kg.) or more, in 14-17 in. (35-43 cm.) of space between truck cab and bed. Weighs from 2,400 lb. (1,080 kg.) with standard 16 ft. (4.8 m.) boom to 2,800 lb. (1,268 kg.) with hydraulically extensible 28 ft. (8.53 m.) boom. Lifts 3,750 lb. (1,700 kg.) at 8 ft. (2.44 m.); 2,500 lb. (1,135 kg.) at 16 ft. (4.88 m.) and 1,250 lb. (567 kg.) at 28 ft. (8.53 m.) (with hydraulically extensive boom full out), boom works in full 360° circle. Hydraulic outriggers stabilize load and prevent damage to truck frame or springs. Dual controls through 35 ft. (10.8 m.) cable and hand switch box. Normally uses the truck P.T.O., but adequate power can be provided by IS MP auxilary electric motor.

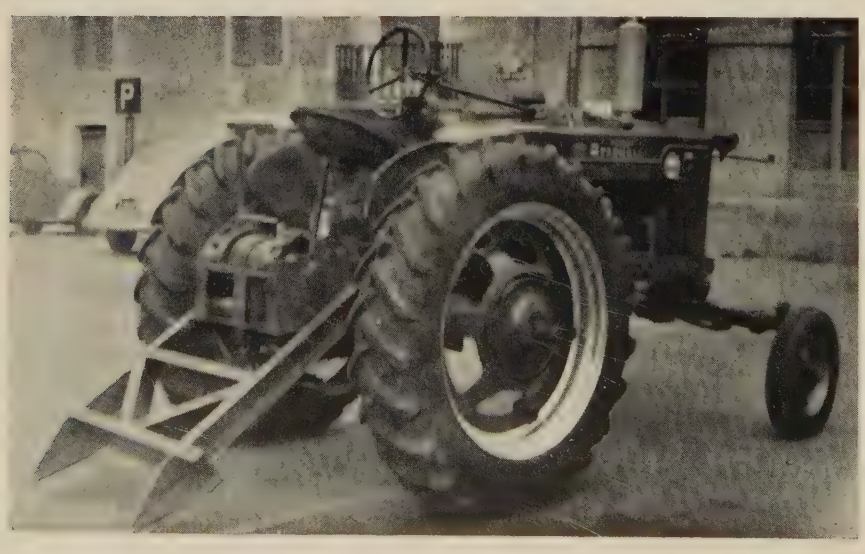
MANUFACTURER: *Teale and Co., P.O. Box 605, Omaha, Nebraska, U.S.A.*

Logging Winch. — Winch with land anchor can be mounted on any type of tractor. Available in three models, load capacity 5-20 tons. Being reversible, there is no need for reverse gear.

MANUFACTURER: *Etablissements Silvant, Saint-Hippolyte, Doubs, France.*

Skidding Hoods. — Hoods used to make it easier to skid logs on ground. Protects trunks or roots as well as the forest roads over which logs are hauled. Whereas hoods are usually made of iron, this type is made of a light alloy. One model, 60 cm. in diam. and 70 cm. long, weighs only 29 kg. compared with 51 kg. for same size in iron.

MANUFACTURER: *Robert Aebi, Uraniastr. 31, Zurich, Switzerland.*



News of the World

Ghana

• A salutary feature of forest administration in the country has been the creation by Act of Parliament of the Forest Improvement Fund. The main feature of the Act is to relieve the Forestry Division of provision of funds by way of the annual consolidated fund estimates. The Government is subsidizing the fund by a grant-in-aid during the Second Development Plan period; in addition, a percentage (40-70 but most commonly 50 percent) of the royalty revenue from reserves, silvicultural fees statutorily imposed on exploiters working in reserves, and rents from concessions wholly overlying forest reserves, is to be paid into the fund.

Italy

• The *Touring Club Italiano* issued in 1960 a special number of its review *Monti e boschi* devoted to progress in research on quick-growing conifers. It follows the special edition of two years ago which gave descriptions of promising quick-growing conifers prepared under the direction of the late Professor Pavari. The prospects of the cultivation of such quick-growing species to the economic and social future of Italy is discussed.

Liberia

• Liberia is the most heavily forested of any country in Africa and should in the future be one of the most important timber producing countries.

During 1947 to 1949 a forest survey was made. The results show that more than one third of the land area is covered by primary and secondary forests, while another third of the area can be classified as broken forest, meaning that the forest areas are interspersed with old farm areas. The broken forest is, however, of commercial importance since considerable volumes of commercial timber can still be found.

The first effort to establish forestry in Liberia was made through the enactment of a law by the Liberian legislature, An Act for the Conservation of the Forest of the Republic of Liberia which was signed by the President in 1953. This law established the Bureau of Forest Conservation under the Department of Agriculture and Commerce and made it a function of the bureau to create the National Forest System. Since 1953, the foresters of the bureau have been engaged in the mapping and surveying of national forests. The total area of these national forests will be 4.3 million acres (1.7 million hectares).

Besides the national forests, which are scattered throughout Liberia and have been demarcated in such a way that no villages or habitation are found inside the boundaries, there is a similarly large area of forest located outside the boundaries. These areas are made available for forest industries. In 1957, an Act was passed establishing cutting rules and regulations covering forest utilization. These rules and regulations are in effect both in the national forests and the forest areas granted to the forest industry.

The basic objective of the forest land-use policy in Liberia is the conversion of both accessible and inaccessible primary and secondary forests into forests-in-use. Within the national forests, forest products exploitation will be carried out by the forest service field organization with contractors. Outside the national forests, exploitation will be done by the industries, with the assistance and technical supervision of the forest service.

Nigeria

• In Western Nigeria, various forms of a tropical shelterwood system are being used to induce regeneration of valuable species in the high forest on a large scale. Treatment was begun during 1959-60 on approximately 34,000 acres (13,600 hectares) of natural forest. This is a formidable undertaking — larger than all other natural regeneration work in tropical Africa put together.

The criticism is sometimes heard that these operations do not induce much new regeneration. It is true that the advance growth is always stimulated by the operations, but regeneration counts in many areas prove that new regeneration is undoubtedly induced, sometimes in large quantities. Simple silvicultural treatments can be relied upon to produce at least 80 good samplings per acre and often to increase the stocking of valuable young trees at least tenfold.

Saudi Arabia

• Reporting on an official visit to this country, the FAO Regional Forestry Officer says that in the Azir mountains about 1 million feddans (1 million acres or 0.4 million hectares) of natural forests exist. The vegetation zones were marked by the following two main species:

1. *Acacia sp. n.* (Arabic "talh") which, according to the British Museum, is probably a new species. The tree occurs in a savanna-type, more or less scattered, but occasional dense patches indicate that it might grow in real forests if only properly protected. The wood is used for a variety of purposes for building, agricultural implements, fuel and others. Probably the bark could be used for tanning, pods for fodder. The tree can stand a heavy degree of grazing with its heavy armature of long straight, ivory-white spines even on the youngest twigs.
2. *Juniperus macropoda* (Arabic "arar"). This tree goes up to the highest elevations; particularly in the cloudy zone it is a substantial tree. It forms dense pure stands and takes over from "talh" which it surpasses in height and in numbers at higher altitudes. "Arar" wood is a most valuable timber which is used for window-shutters, doors, panelling, and all other sort of interior decoration. It is also suitable for pencil-making.

Unfortunately, any systematic attempt to introduce more tree species, especially the entirely missing conifers, is made difficult due to lack of meteorological data.

The Government could easily facilitate the matter by providing simple equipment (rain-gauges, thermometers, hydrometers, barometers) to the existing agricultural units, which could then keep current recordings of temperature, rainfall, distribution of rainfall, etc.

" From all my observations in the cities of Jeddah, Taif, El Riad and especially all over the Azir mountains, I got the impression that wood consumption in the country is relatively high, " the report says. " Tremendous amounts of fuelwood are drawn from the forests and by interviewing local farmers I found out that a rural family in Azir consumes about 2.5 tons of fuelwood per year (1 ton = 60 rials). But also for all other purposes wood is used, quite often in a wasteful way.

Large amounts of charcoal are shipped to other countries. All this would be perfectly all right if the forests were properly managed. I was told by one of the officials in Biljurshi that a regulation exists which prohibits the cutting of green trees. This is certainly a wise order, but there is no control to enforce this law and the great piles of fuelwood, poles and logs which I saw on the markets and in village yards did not stem from dead trees.

The present state of the existing natural forests is altogether alarming. The greatest part of the original forest wealth has already disappeared and one can easily forecast that in about 50 years the last remnants of forests will have disappeared.

From all my discussions with officials, it appeared that nobody in Azir had ever planted a forest tree."

The fact that Saudi Arabia has developed, within a period of 28 years, from an almost unknown area of deserts and tribal conflicts to an influential member of the world family of nations, encourages the hope that forest protection can be instituted and a national forest service formed.

Spain

• The publication *Principales insectos que atacan a las frondosas en España* (Ministerio de Agricultura, Dirección general de Montes, Casa y Pesca fluvial, Madrid, 1960), is an excellent and clearly presented study dealing with the principal insects which cause severe damage to forest trees in Spain. Drawings and photographs illustrate the different stages of the insects' evolution as well as the damage caused, thus permitting ready identification in the field. The volume should be most useful for foresters of the Mediterranean countries.

United Kingdom

• The International Society of Photogrammetry held its Ninth Congress n London during September 1960. Because this period clashed with the Fifth World Forestry Congress, the forestry delegation to the Commission on Photo-Interpretation was appreciably smaller than at the previous ISP Congress in Stockholm in 1956.

Perhaps the greatest advance of interest to foresters requiring accurate topographic maps of mountainous forest areas is the use of electronics for height control by means of the airborne profile recorder (APR), which has been under development for a number of years and which has now emerged from the experimental stage to productive use. A paper presented at the congress described experience with this instrument for the contour mapping of a large reservoir site in the tropics, and indicated how APR control was later used to eliminate the tedious and expensive work of aerotriangulation on photogrammetric plotting instruments. Some ground control is still needed even with this apparatus but it can be greatly reduced compared with normal methods, and it can also be confined to the more accessible sites, thereby appreciably speeding up the field work.

The full proceedings and copies of the papers presented to the International Society for Photogrammetry are being published and will be available from the Secretary-General, International Society for Photogrammetry, 25 Bruton Street, London W.1.

• *Science and the Forester* (by Leslie Wolff, senior lecturer in biology, Newton Park College, Bath), is an interesting example of a book designed to appeal to young students who aspire to a career that is not confined to the four walls of a laboratory or office. The forests can offer them the wide horizons that they seek. The forester's intervention in the forests entrusted to his care can be an exciting adventure that requires a great deal of knowledge and understanding of natural laws. The author reveals the secrets with simplicity without giving the impression that all enigmas have been solved; on the contrary, he shows that there is a vast field still open to those who wish to devote their lives to this career.

• By selection and hybridization, plant breeders have introduced increasingly productive varieties of farm and garden crops. The process is being extended to forestry in an effort to produce trees which will grow faster, provide better timber, and quicken the economic rehabilitation of poor upland soil. Experience in these directions will be a British contribution to the seed year which FAO is now beginning.

Time is the handicap to all tree research. In forestry, men create values for the future. If trees were planted which grew to full profit in 15 or 20 years less than is now normal, such value would be realized sooner and be enhanced. The Forestry Commission and private owners are combining to bring this about by raising trees from better seed and by study of tree genetics.

First, the country was surveyed to find " plus trees " (superior examples of all useful species) to serve as seed sources. Seed from these is certified, and young trees in future will be raised from it.

In time, as characteristics emerge such as suitability for varying soils and climates, it is likely that separate varieties will be evolved in each species by selective breeding, as happened long ago with fruit trees. In speeding up the evolution of useful varieties in forest trees, orchard techniques are being used.

Grafting is much used in research. Conifer seed from grafted scions is available for testing in five years instead of the 15 which nature demands. Production of seed for sowing in small quantities can be similarly accelerated.

Performance testing of young trees is also used as a guide to the future. By this, the growth in height and cubic capacity is measured over a period, as is the live-weight gain of young cattle, and deductions are drawn. As a result information is now available in two years which would previously have taken 15 years to obtain.

United States of America

• Many difficulties arise in basing projections into the future on past trends in land use. *Land for the future* (by Marion Clawson, R. Burnell Held and Charles H. Stoddard and published for Resources for the Future Inc. by the Johns Hopkins Press, Baltimore, $ 8.50), is therefore of interest primarily for the methodology adopted by its authors, which is appropriate also for countries other than the United States. An interesting subchapter, unfortunately too short, is devoted to a subject of great import to foresters and one that was discussed at length at the Fifth World Forestry Congress, namely multiple land use.

• *The forest ranger: a study in administrative behavior* (by Herbert Kaufman, published for Resources for the Future Inc. by Johns Hopkins Press, Baltimore, $ 5.00), shows how the Forest Service of the United

States, despite the diversity of its tasks, can claim not only to have a highly qualified technical staff but also to constitute a perfect entity, a corps whose members are a combination of executive and operator and through which orders and directives are carried out to the letter and in the proper spirit.

The originality of this work is that it considers the structure of an administrative agency in the light of the tasks it must fulfil, not from the top to the bottom but from the bottom up.

• A third edition has appeared of *Diseases and pests of ornamental plants* (by Pascal P. Pirone, Bernard O. Dodge and Harold W. Rickett, and published by the Ronald Press Co., New York, $10).

An official publication of the New York Botanical Garden to the staff of which the authors belong, the book, as did its predecessors (1943, 1948), will help amateur and professional gardeners combat the manifold diseases and pests of ornamental plants. As such, it has become a standard reference guide in respect of ornamental plants of the United States, and this new edition incorporates up-to-date information on control measures.

• The progress of forestry and related natural resource management in the United States since 1900 is chronicled in a 320-page book published by the Society of American Foresters. Edited by Henry Clepper, executive secretary of the Society, and Arthur B. Meyer, editor of the *Journal of forestry*, *American forestry: six decades of growth* is the only comprehensive history available of the 60 years that span professional forestry in America. It provides, moreover, an insight into the interrelationship of all forest values and the multiplicity of modern demands upon those resources. Preparation and publication of the book commemorated the sixtieth anniversary of the society, formed in 1900.

• Another sixtieth anniversary celebrated in 1960 was that of the Yale University School of Forestry, whose alumni are deans and heads of half of the nation's forestry schools. The program of the celebration highlighted worldwide scientific forestry developments during the last ten years.

Forest Legislation

FAO publishes quarterly in English, French and Spanish editions Food and agriculture legislation, *a selection of laws and regulations of international importance. Notes on recent forest legislation of interest are reproduced below.*

Canada (Manitoba)

• *The Watershed Conservation Districts Act*: an Act to provide for the establishment of watershed conservation districts to conserve the water resources of the Province. 4 August 1959. (*Statutes of Manitoba*, 1959, 8 Elizabeth II, pp. 521-548)

There may be established watershed conservation districts and, in respect of each district, a board having the following aims and objects: to promote the conservation and control of the water resources and, for that purpose, to study, undertake, put into effect, operate, or maintain, a scheme in respect of the district with a view to conserving, controlling, developing, protecting, restoring or using (*a*) the water resources within or available to the district and (*b*) the land, forest, wildlife and recreation resources thereof.

A watershed conservation commission is established to give advice and guidance to the district boards and to advise the Minister of Agriculture and Conservation in all matters relating to the Act and the administration and operation thereof.

Canada (Newfoundland)

• *The Saw Mills Act, 1959*: an Act to amend and consolidate the law respecting the operation of sawmills 6 July 1959. (*Statutes of Newfoundland*, 1959, pp. 388-393)

The Act contains detailed provisions relating to licences and rights conferred thereby. All licensees are to take precautions against fire, pursuant to the Forest Fires Act.

The Minister of Mines and Resources is empowered to make regulations prohibiting all unnecessary waste of timber in sawing or manufacturing timber, regulating the disposal of waste from mills, providing for the grading of any or all mill products and establishing standards by which different grades of such products shall be known.

Ceylon

• *Regulations under the Soil Conservation Act No. 25 of 1951*. 16 December 1959. (*Ceylon Government Gazette*, No. 12,027, 1 January 1960, Part I, p. 5)

In order to prevent or control soil erosion, or to preserve soil resources, owners of any land cultivated in any crop may be directed to carry out measures (*a*) for the prevention of damage by fire, by cutting and maintaining fire belts; (*b*) for the prevention of grazing, by installing fences; (*c*) for planting forest trees; (*d*) for erecting check dams and contour wattling.

Where degraded forest land, which has been cleared for food production but has not been so used, is subject to soil erosion, the owner shall cause the land to be afforested to an extent specified by the Director of Agriculture.

Costa Rica

• *Executive Decree No. 1*: creating a committee for the protection of forest wildlife. 2 February 1960. (*La Gaceta*, No. 52, 4 March 1960, p. 931)

The functions of the committee are to propose, encourage and coordinate all measures, programs, studies and projects for improving forest wildlife administration; to study and recommend solutions to the technical problems of forest wildlife adminis-

tration lying within the province of the Department of Lands and Forests; to draw up regulations under an Act on wildlife protection contributing to the improved application thereof; and to take action necessary to ensure that the work program of the Ministry in respect of wildlife protection shall be properly co-ordinated with the other branches thereof and with other state and private agencies created for the preservation of natural resources.

Federation of Malaya

• *Land Conservation Act, 1960.* 23 April 1960. (*Federation of Malaya Government Gazette*, Vol. IV, No. 11, Act Supplement No. 1, 5 May 1960, pp. 9-19)

The purpose of the Act is to consolidate the law relating to the conservation of hill land and the protection of soil from erosion and the inroad of silt. Except under permit, no person shall plant any hill land with short-term crops, clear any hill land or interfere with, destroy or remove any trees, plants, undergrowth, weeds, grass or vegetation on or from any hill land. Owners or occupiers of land may be required to take measures if earth, mud, silt, gravel or stone from land has caused or is likely to cause damage to other land or to any watercourse. The Act contains detailed provisions governing procedural matters.

Honduras

• *Decree No. 213-A*: declaring all lands presently belonging to the State to be national reserve zones. 3 September 1953. (*La Gaceta*, No. 16.899, 10 October 1959, p. 1)

This is a general conservation measure, intended to permit long-term agricultural and land-use planning. Forest and other national resources existing on lands referred to also enter into the national reserve.

India (West Bengal)

• *Resolution No. 20550 L. Ref. of 6 November 1959*: on the constitution of a land utilization board. (*The Calcutta Gazette*, No. 46, 12 November 1959, p. 3922)

A land utilization board is established with a view to determining the steps necessary for the proper utilization of all available lands and water areas in the State. The functions of the board are, among others, to collect detailed information regarding lands which have vested in Government under the West Bengal Estates Acquisition Act of 1953, to obtain technical reports concerning the suitability of the different blocks of lands for agriculture, afforestation, etc. and to formulate soil conservation measures and measures to combat soil erosion.

Japan

• *Act No. 21 of 1960*: relative to emergency measures concerning forest conservation and flood control. (*Official Gazette*, Special Issue, No. 24, 31 March 1960, pp. 7-8)

A plan is to be drawn up by the Minister of Agriculture and Forestry in consultation with the Central Forestry Advisory Council. A similar plan is to be drawn up by the Minister of Public Works in consultation with the River Advisory Council. The Minister of Agriculture and Forestry is to draw up plans for conservation in mountain areas. The Minister of Public Works is responsible for river protection.

Both ministers, prior to drawing up their respective plans, should consult and co-ordinate their ideas and should consult with the Chief of the Economic Planning Agency. The two plans will be subject to government approval. The Government will take all measures necessary for executing these plans.

Conservation in mountain areas is to be carried out with the financial assistance of the Central Government under the Forestry Act and the Landslide Prevention Act.

Mexico

• *Forest Act.* 9 January 1960. (*Diario Oficial*, No. 13, 16 January 1960, pp. 7-17)

This basic text replaces the Forest Act of 30 December 1947. Its purpose is to regulate the conservation, restoration, development and use of forest vegetation, the transportation of and trade in products derived therefrom, the administration of the forest service and the proper development and integration of the forest industry.

Poland

• *Order of the Council of Ministers*: creating the Woliński National Park. 3 March 1960. (*Dziennik Ustaw*, No. 14, 15 March 1960, text 79, p. 141)

The Minister of Forestry and Woodworking Industries is to fix in detail the extent and boundaries of the park, as well as the restrictions regarding its various parts. On the reserves, all economic activities must be in keeping with the requirements and purposes of the protection of nature. However, restrictions are not to interfere with the exercise of economic activities deemed appropriate by the director of the park from the viewpoint of rational land utilization.

Venezuela

• *Land Reform Act.* 22 February 1960. (*Gaceta Oficial*, No. 611, Extraordinario, 19 March 1960, pp. 1-19)

Article 28 of the Land Reform Act provides that national parks and forests, forest reserves, protected zones, wildlife sanctuaries, etc., shall be immune from assignment for the purposes of agrarian reform.

Title III establishes a farm credit service which may grant credit *inter alia* for reforestation.

Yugoslavia

• *Regulations by the Secretariat for Agriculture and Forestry of the Federal Executive Council*: relative to the economic and technical information in the investment plans for the creation of intensive cultivation of quickgrowing trees. 8 April 1960. (*Službeni List*, No. 17, 27 April 1960, text 233, pp. 356-357)

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